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Fig. A. Granulation tissue at the umbilicus in the new-born. (Gyn.-Path. No. 26463.)

Fig. B. An umbilical polyp. (C.H.I. No. 18780.)

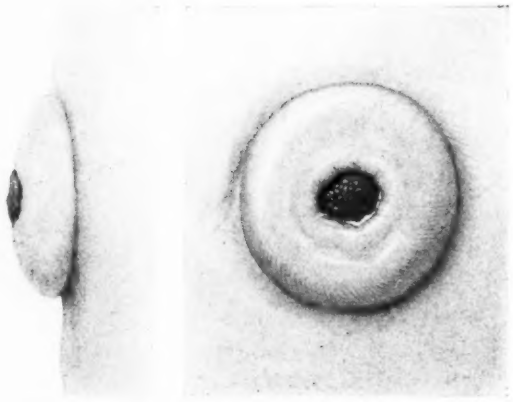

Fig. C. Large indurated umbilicus with reddish tissue in its center. (Dr. Winslow's case.)

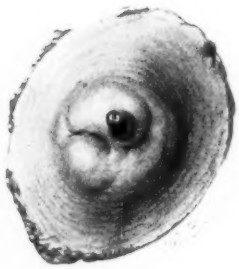

Fig. D. Nævus of the umbilicus. (Gyn.-Path. No. 24661.)

PLATE I.

Notes on Diseases of the Umbilicus.—Thomas S. Cullen.

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE PUBLISHED MONTHLY

VOLUME XXXV SEPTEMBER, 1922 NUMBER 3

FURTHER NOTES ON DISEASES OF THE UMBILICUS[1]

BY THOMAS S. CULLEN, M.B., BALTIMORE

From the Gynecological Department of The Johns Hopkins Hospital and The Johns Hopkins University

OUTLINE

Tetanus in the Newborn
Granulation Tissue at the Umbilicus in the Newborn
Umbilical Polyps of Omphalomesenteric Duct Origin
Meckel's Diverticulum
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  c. A Pin Embedded in the Wall of
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Sarcoma of the Umbilicus, secondary
Amnion Umbilicus
Umbilical Hernia at Birth
  1. Uncomplicated
  2. Strangulated and Associated with Peritonitis
A Satisfactory Method of Dealing with Intestinal Loops Densely Adherent to the Walls of an Umbilical Hernia
Persistence of the Urachus
Comment

SINCE the appearance of my book on diseases of the umbilicus,[2] six years ago, quite a number of American surgeons and pathologists have been good enough to draw my attention to cases coming under their notice, and quite a few have sent me the specimens for study.

During this period I have seen and operated on a goodly number of such cases. In the present paper I shall refer briefly to these cases, but shall not attempt to include the recent literature on the subject. To enter into a full discussion of the various lesions here considered would be a needless repetition, inasmuch as nearly all umbilical and urachal diseases were more or less fully analyzed in my book. Where necessary I shall, in a footnote, refer the reader to the page in the original volume where a full discussion of the given subject may be found.

TETANUS[3] IN THE NEWBORN IN CHINA

During the summer of 1916 Dr. Jennie M. Logan, who had just returned from China,

[2] Thomas S. Cullen. Embryology, Anatomy, and Diseases of the Umbilicus, together with Diseases of the Urachus. Philadelphia: W. B. Saunders Co., 1916.

[3] Diseases of the Umbilicus, p. 95.

PLATE I

Fig. A. For full description see p. 259, Gyn.-Path. No. 26463.

Fig. B. For full description see p. 260, Gyn.-Path. No. 18780.

Fig. C. For full description see p. 262.

Fig. D. For full description see p. 271, Gyn.-Path. No. 24661.

[1] Presented before the Southern Surgical Association, Pinehurst, North Carolina, December 13-15, 1921.

visited Baltimore and we were discussing tetanus in the newborn. Her description of the appalling lack of asepsis during labor among the poor Chinese women of Hunan Province was so vivid that I asked her if she would not write me a short account of what she had actually witnessed there. Under date of October 11, 1916, Dr. Logan wrote from Boston, as follows:

"The usual preparation for lying-in by a poor Chinese woman in Hunan Province consists in getting together a roll of the cheapest paper made of straw, a large, old, low wash-tub about 4 or 5 inches deep, a small wooden stool 6 inches high to sit on in the tub, two shovelfuls of wood ashes wrapped in the straw paper for the bed, an old pair of scissors, a slop bucket, and a string.

"The mother sits on the stool, leaning against a friend or a washstand, the child is born into the tub, which already holds the amniotic fluid and previous discharge, and is caught up by the midwife or a neighbor; the cord is tied with any old string and the child rolled into the oldest, dirtiest garment the household affords. With such ushering into life it is small wonder that in our women's dispensary there are frequent cases of tetanus neonatorum. The person who brings the child generally tells us that the baby won't nurse. One finds the muscles convulsed, the little jaw rigid, and the umbilicus either red or angry-looking, or quite black and foul-smelling. The child is almost invariably about 10 days old.

"Just before the end of May a case came in with the mouth open though the jaws were perfectly rigid and could not be budged either to open or to close the mouth further. The hands too were not quite closed even during the convulsion but were perfectly stiff.

"We have had such cases for a period of 18 years in the dispensary, and of late have not tried to help them in any way as it always was hopeless, and the attempt and failure did not help our work."

Dr. L. M. Miles, who soon goes to the gynecological department of the Peking Medical School, and who has been working with me in the gynecological department for the past year, has on several occasions spoken to me of the treatment of the umbilical cord in the part of China in which he has lived, and has drawn attention to the great frequency with which the newborn child develops tetanus. The reason why is clearly shown in the accompanying description.

Under the heading "The Treatment of the Umbilical Cord and of the Newborn Babe in Shantung Province, China," Dr. Miles writes: "The people of Shantung Province of China are for the most part poverty-stricken. Hence they cannot afford even the simplest of layettes for the newborn babies. Cotton cloth for diapers is out of the question because of cost. Consequently they have striven to find the cheapest possible substitute. This consists of a bag of coarse, native woven cotton cloth which fits the baby loosely and encloses it from the axillæ down.

"As soon as the child is born, the cord is tied with any old whisp of string and the baby is placed in this bag, which is then filled with dry dust from the field or street and the bag is then tied around the child's body. Under favorable circumstances the bag may be emptied and fresh dust substituted in a few days; in winter, when the ground is frozen, the dirt may merely be dried out over the fire and replaced in the bag.

"Such a procedure is, as can well be imagined, often followed by tetanus neonatorum. It will be erring on the side of conservatism to say that 50 per cent of the babies thus cared for die within the first 10 days of life."

GRANULATION TISSUE AT THE UMBILICUS IN THE NEWBORN[1]

In these cases the umbilical stump does not heal kindly. A small red mass is found in the umbilical depression, and from it there is usually a slight discharge of pus. When one examines the small red mass, it is usually found to be flabby, but in the case shown in Plate I, A, it was unusually firm.

On microscopic examination these growths are found to consist of granulation tissue.

[1] Diseases of the Umbilicus, p. 116.

The surface is covered with polymorphonuclear leucocytes. The outer layers are composed of granulation tissue and the central portion may be more or less organized (Fig. 1). Such small masses are totally devoid of epithelium.

Granulation Tissue at the Umbilicus in the Newborn

I saw C. W., a colored baby, 1 month old, at the Harriet Lane Home on December 17, 1920. No abnormality at the umbilicus had been noted at birth. Two weeks before admission the child had had a three-hour crying spell, and discharged a considerable amount of blood from the navel, and on examination the mother had noticed a small raspberry-like growth in the umbilical depression (Plate I, A). Since that time there had been a constant yellow discharge from the navel and the mother thought that the protrusion had become larger.

Operation. The small growth was gently lifted up with broad-pointed stomach clips and the base ligated with one plain catgut ligature. The growth was then cut away.

Gyn.-Path. No. 26463. The surface of the polyp is covered with polymorphonuclear leucocytes and fibrin. Beneath this is typical granulation tissue. The central portion of the polyp shows fairly well organized connective tissue. At some points are areas of œdema. Clinically, it bore a striking resemblance to an umbilical polyp due to remnants of the outer end of the omphalomesenteric duct. Histologically, however, no such similarity was found.

An Umbilical Polyp Consisting of Granulation Tissue

Surgical No. 46938. G. C., age 1 month, was admitted to the Harriet Lane Home on December 3, 1918. He had vomited occasionally since birth. The navel had never healed and protruded, especially when the child cried. There was some foul-smelling discharge coming from the umbilicus.

On examination a firm, lobulated, red, glistening, pedunculated tumor, about 6 millimeters in diameter, was found projecting from the umbilical depression. The firmness of the tumor suggested an umbilical polyp due to the persistence of the outer end of the omphalomesenteric duct.

Operation, December 9, 1918. With intestinal clips I grasped the skin close to the umbilicus on each side to make the tissues taut. An elliptical incision was then made, and the umbilicus removed. The excision extended down to the peritoneum.

The convalescence was uneventful.

Gyn.-Path. No. 24517. The surface of the polyp (Fig. 1) is covered by polymorphonuclear leucocytes. The superficial layers of the nodule are composed of typical granulation tissue, there being many young capillaries with young connective-tissue cells and polymorphonuclear leucocytes between them. The central portion of the polyp consists of connective tissue, rich in capillaries. Scattered throughout it are many young connective-tissue cells. Very few polymorphonuclear leucocytes are to be noted in the central portion of the polyp.

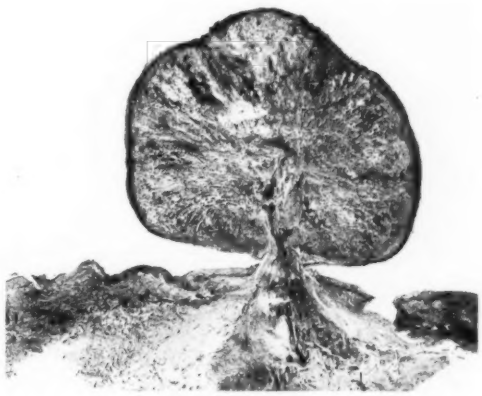

Fig. 1. An umbilical polyp consisting of granulation tissue.

Surgical No. 46938. Gyn-Path. No. 24517. The squamous epithelium of the umbilicus presents the usual appearance. Springing from the umbilicus by a delicate pedicle is a somewhat round polyp. Its surface was covered by polymorphonuclear leucocytes, and the superficial layers of the nodule were composed of typical granulation tissue. The central part of the polyp consisted of connective tissue, rich in capillaries.

From the above it is clearly evident that the polyp consisted essentially of granulation tissue, no epithelial elements being present.

The squamous epithelium of the umbilicus showed some polymorphonuclear infiltration near the pedicle of the polyp.

It is unusual to find so firm an umbilical polyp unless it is due to a remnant of the omphalomesenteric duct. Where such is the case, little or no inflammation exists. The outer surface is covered by intestinal mucosa, and the center contains strands of non-striped muscle.

Clinically, this polyp bore a striking resemblance to a polyp of omphalomesenteric origin; histologically, however, no such similarity existed.

UMBILICAL POLYPS OF OMPHALOMESENTERIC DUCT ORIGIN[1]

Occasionally, when the cord comes away, a bright red polyp is noted in the umbilical

[1] Diseases of the Umbilicus, p. 120.

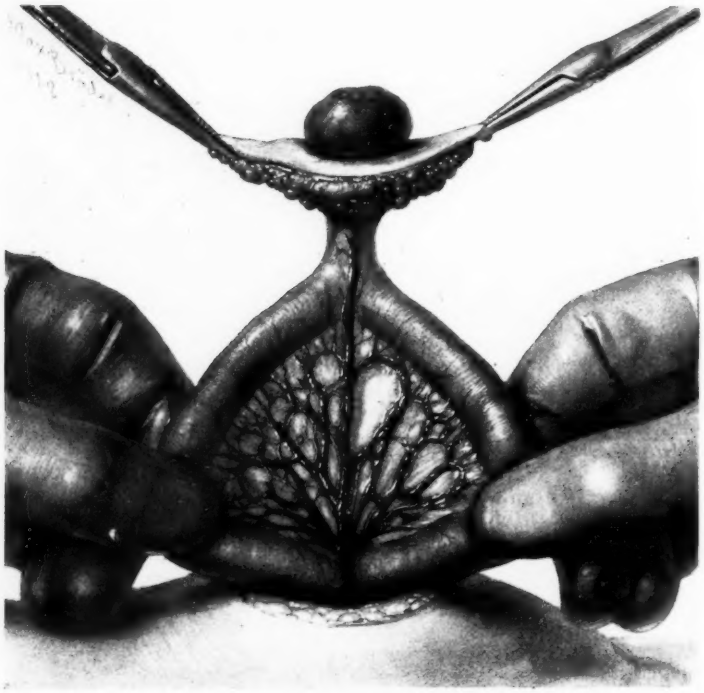

Fig. 2. An umbilical polyp associated with a Meckel's diverticulum.

C. H. I. No. 18780. An elliptical incision, including the umbilical polyp, has been made and the umbilicus lifted well away from the abdominal wall. Passing off from the loop of small bowel is a Meckel's diverticulum. This is firmly fixed to the inner surface of the umbilicus. Firmly attached to the outer surface of the umbilicus is the umbilical polyp. The small hole noted on the surface of the polyp, and into which a probe can be carried for 8 millimeters, is evidently the remnant of the lumen which formerly was continuous with Meckel's diverticulum. Both the omphalomesenteric artery and vein still persist. They pass from the mesentery of the small bowel over the surface of the bowel and along the diverticulum to the umbilicus. For the histological picture of the umbilical polyp see Figure 3.

depression. When this does not consist of granulation tissue, it is usually the remains of the outer end of the omphalomesenteric duct.

Granulation tissue usually soon dries up under astringent treatment, whereas the polyp consisting of embryonic remains persists.

Case C. H. I. 18780 is a notable example of the umbilical polyp originating from the omphalomesenteric duct. In Plate I, B, we see the bright red polyp welling out of the umbilicus and secreting a relatively clear fluid. Roughly the polyp resembles a cherry. It is 1 centimeter in diameter. Near the middle is a roundish elevat on. At this point a probe could be carried into the polyp for 8 millimeters. The growth was covered by a definite mucosa, which on histological examination was found to be typical mucosa of the small bowel (Fig. 3). On the surface are a few drops of mucus and a large drop has just fallen off on to the abdomen. Figure 2 shows that there is also a Meckel's diverticulum which extends up to and is blended with the abdominal wall at the umbilicus.

This case came within an ace of being one of patent omphalomesenteric duct. Had this been true fæcal matter would have escaped from the umbilicus as soon as the cord came away. In some cases the polyp is the only remnant of the omphalomesenteric duct, in some the vessels of Meckel's diverticulum persist and are adherent to the abdominal wall; occasionally, the duct is

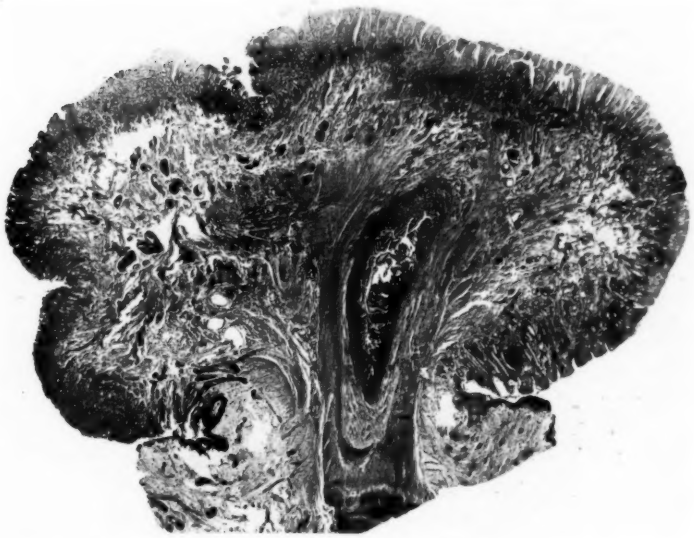

Fig. 3. An umbilical polyp covered over by intestinal mucosa.
C. H. I. No. 18780. From a section through the fiery red polyp seen in Plate I, B. In this case a Meckel's diverticulum existed and was attached to the umbilicus (Fig. 2). In the lower part of the picture one sees the squamous epithelium. Covering the polyp is typical mucosa of the small bowel. In this case a probe could be carried down through the polyp for some distance. The cavity in the center of the polyp is formed by an oblique section of this fistulous tract. This tract also is lined with mucosa of the small bowel, and represents the outer end of the omphalomesenteric duct. In the center of the polyp is much non-striped muscle, which encircles the fistulous tract.

patent and the polyp also exists. Cases of 2 remnants of the omphalomesenteric duct form a most interesting group.

Dr. Randolph Winslow's case bore much resemblance to the one here reported.

Dr. R. M. Harbin[1] of Rome, Georgia, in a short but interesting article published in 1917, reported several cases somewhat similar in character.

Umbilical Polyp Associated with a Meckel's Diverticulum

C. H. I. No. 18780. J. A., 1 year old, was admitted to the Church Home and Infirmary, March 30, 1918. This child had at the navel a bright red mass, about 1.5 centimeters in diameter (Plate I, B). This was first noted when the cord came away. It was slightly lobulated and at one point a probe could be carried down for about 8 millimeters. In lifting up this mass, it was found to be surrounded on all sides by normal skin which extended up over its surface for about 7 millimeters.

[1] R. M. Harbin. Meckel's diverticulum; with special reference to umbilical disorders of infancy. Southern M. J., 1917, Feb., 148.

Operation. We made an elliptical incision which encircled the umbilicus and gradually cut down until we got to the peritoneum. The peritoneum was severed on all sides and we were able to raise the umbilicus with the tumor and the underlying tissue away from the abdominal wall (Fig. 2). When the umbilical tumor with the surrounding skin was lifted up, a loop of small bowel emerged through the umbilical opening and we found that we were dealing with an umbilical polyp firmly adherent to the umbilical depression and that this was continuous with a Meckel's diverticulum. We placed a purse-string suture around the base of Meckel's diverticulum exactly as in the case of an appendix operation. After severing the diverticulum with the cautery, we turned in the stump and tied the purse-string. This was reinforced by three fine mattress sutures of black silk. The peritoneum and fascia were closed with two rows of mattress sutures of chromacized catgut, the adipose tissue was brought together with fine catgut and the skin with black silk. The child stood the operation well.

April 1. Last night the child's respirations became accelerated, it grew restless, and the pulse became rapid. This morning the respirations were 60. After an enema the child had a small stool.

Fig. 4. A child with an abnormal umbilicus.
Plate I, C, gives the appearance of the indurated umbilicus with the reddish area in the center. Below the umbilicus in the mid-line is a definite dome-like swelling. (Photograph sent to me by Dr. Randolph Winslow.)

Dr. Charles L. Summers made out a definite bronchopneumonia in the lower lobes of both lungs and a very unfavorable prognosis was given. The child died at 6 p. m.

At autopsy we found the bowel above the point of operation considerably distended, whereas below the point of attachment of Meckel's diverticulum it was somewhat contracted. The stump of Meckel's diverticulum that had been turned in had become congested and partly filled the lumen of the bowel. There was no fluid in the abdomen and no evidence of peritonitis. There was a definite bronchopneumonia in the lower lobes of both lungs.

In this case the bowel was very small, so small that when the stump of Meckel's diverticulum had been turned into it its lumen was considerably narrowed. We noted this carefully at operation, but the lumen apparently was still sufficient. Autopsy, however, showed that the inverted stump had swollen up after operation and almost completely blocked the bowel. In subsequent cases I should be inclined to leave little if any stump to the diverticulum but cut it off almost flush with the lumen of the bowel and close this opening just as one would an ordinary linear incision in the gut, namely, with two rows of continuous silk, a very narrow margin of the gut being turned in, in view of the fact that the lumen is naturally so small in the young child. If closure be made transverse to long axis of the bowel, there will be less narrowing of the lumen.

A Meckel's Diverticulum Associated with an Umbilical Tumor (Dr. Randolph Winslow's Case)

On April 1, 1918, Dr. Randolph Winslow sent me two pictures of a case which had come under his observation. In this small child the umbilical region was represented by a large, indurated area in the center of which was reddish tissue. When the child lay in the dorsal position (Fig. 4 and projected drawing, [Plate I, C]) a marked prominence of the abdomen was apparent just below the umbilicus. Dr. Winslow said that in this case a Meckel's diverticulum was adherent to the indurated umbilicus. He removed the diverticulum and the umbilicus. In all probability the reddish area in the center of the umbilical depression was a remnant of the outer end of the omphalomesenteric duct.

MECKEL'S DIVERTICULUM

In my book on *Diseases of the Umbilicus* I did not attempt to discuss abnormalities or diseases of Meckel's diverticulum with any degree of fulness, but confined my attention in the main to a consideration of those abnormalities of the diverticulum that were closely associated with lesions at the navel. However, as Meckel's diverticulum is the inner end of the omphalomesenteric duct which in early embryonic life opens at the umbilicus, it is due some consideration.

Gastric Mucosa in the Tip of Meckel's Diverticulum

Emil Goetsch,[1] in 1919, reported the case of a man, 19 years of age, who had intestinal obstruction due to a Meckel's diverticulum which was adherent to the abdominal wall and to the omentum. The patient made a good recovery. Goetsch found the proximal end of the diverticulum lined with intestinal mucosa, but the distal portion for at least 1.5 centimeters was lined with a mucosa totally different in character. This on histological examination proved to be gastric mucosa. The case was most carefully studied from every standpoint and was well illustrated. Goetsch's paper should be read by everyone interested in the subject. Accompanying the article is a complete bibliography.

An Accessory Pancreas in the Tip of Meckel's Diverticulum

Elsewhere[2] I referred briefly to a case reported by Bize, in which an accessory

[1] Emil Goetsch. The occurrence of gastric mucosa in a case of Meckel's diverticulum producing intestinal obstruction. Johns Hopkins Hosp. Bull., 1919, xxx, 143.

[2] Diseases of the Umbilicus, p. 163.

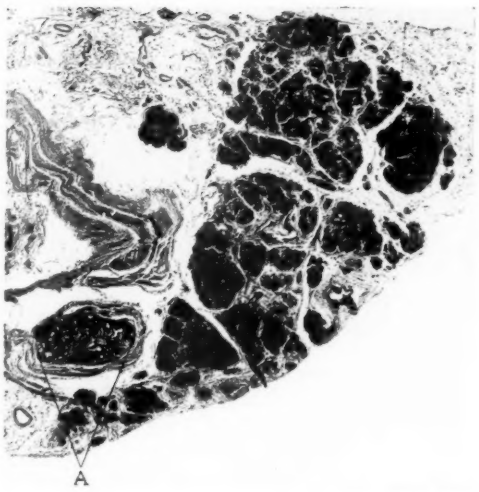

Fig. 5. An accessory pancreas in the tip of Meckel's diverticulum.

This is a very low power photomicrograph of a portion of the tip of Meckel's diverticulum sent me by Dr. Douglas Symmers. The specimen is very thick and the picture is shown merely to give the reader an idea of the location of the pancreatic tissue. *a*, Is the extreme tip of the diverticulum distal to the point where a lumen exists. All the other dark areas consist of pancreatic tissue.

pancreas was found in the tip of Meckel's diverticulum. In the literature accompanying Goetsch's article are references to quite a number of similar cases.

On April 1, 1920, Dr. Douglas Symmers, director of laboratories, Bellevue and Allied Hospitals, sent me a section from the tip of Meckel's diverticulum. This contained pancreatic tissue (Fig. 5). Dr. Symmers' letter is as follows: "I am sending to you under separate cover a section of an accessory pancreas removed from the tip of a Meckel's diverticulum of the small intestine, lying about 30 centimeters above the ileocæcal valve. The diverticulum measured about 6 centimeters in length. The accessory pancreas lay at the extreme free end and was about the size of one's little finger nail. On section it presented the typical naked-eye appearance of pancreatic tissue and on microscopic examination you will observe that, in addition to ducts and acini, there are several islands of Langerhans. There are also several small nests of ganglion cells in the interstitial tissues of the gut."

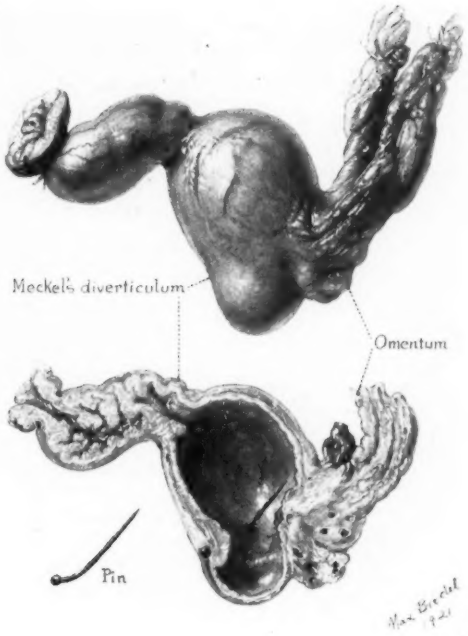

Fig. 6. Meckel's diverticulum with a pin embedded in its wall and with the omentum densely adherent to the tip of the diverticulum.

C. H. I. No. 27137. The specimen contracted markedly after removal. At the time of operation Meckel's diverticulum was of a uniform caliber for its entire length. In the upper picture we see that the omentum is intimately blended with the tip of the diverticulum. At this point all omental fat had disappeared. In the lower picture a pin is seen firmly embedded in the wall of the diverticulum. It was near the free point of the pin that the omentum had become so adherent.

Meckel's Diverticulum Containing an Ordinary pin with its Head Buried in the Wall of the Diverticulum Near its Tip, the Point of the Pin Lying Free in the Lumen.

C. H. I. No. 27137. Frank C., age 22, was sent to the Church Home and Infirmary by his physician, Dr. A. H. A. Mayer, on November 5, 1921. On November 4 this patient had a temperature of 105°. On the afternoon of the next day it was 104°, but by evening it had dropped to 102°.

His leucocyte count was 50,000. He had definite pain beneath the costal margin on the right. A ruptured duodenal ulcer or an acute gall bladder was at once suspected. The patient also had a definite friction rub over the lower right chest.

He was at once removed to the operating room

and a right rectus incision was made. The liver extended down as far as the umbilicus, the gall-bladder was normal, and the duodenum showed no change.

The appendix was drawn up and removed through the right rectus incision. It was much enlarged, injected, and presented the characteristic picture of an acute inflammation.

When an attempt was made to pull the omentum up, it was found intimately blended with what appeared to be a straight piece of bowel, in other words, a piece of intestine with no return loop. It was at once recognized as a Meckel's diverticulum. The omentum had grown fast to its entire tip, and at this point consisted almost entirely of fibrous tissue, being here practically devoid of fat.

A gridiron incision was made and the diverticulum drawn out through it and removed. The diverticulum was cut away close to the lumen of the bowel. The intestinal wall was closed with a through-and-through continuous mattress suture of catgut and then with a continuous black silk suture. Great care was taken not to narrow the lumen of the bowel. Nevertheless, when the opening was closed, the lumen at this point was only two-thirds its natural size. I debated for some time whether to do a lateral anastomosis, but thought the bowel would surely take care of itself.

After operation the temperature still remained high, and from time to time the abdomen would become markedly distended. There was also a good deal of fæcal vomiting. The stomach was washed out every few hours, and frequent enemata were given. Finally, the fæcal vomiting stopped, but the marked distention still persisted. Dr. Thomas R. Boggs, who saw him with Dr. Mayer at this time, found definite signs of pneumonia at the angle of the scapula on the left side.

The abdominal distention became intense and on November 12 I made an enterostomy. We had no choice but were forced to take the first loop of distended small bowel that presented. It was evidently high up as the abdominal wall had been much excoriated. From this time on the patient's general condition has improved. Later on we closed the fistula. The patient is now perfectly well.

In future, after removing the diverticulum, if there is any appreciable narrowing of the bowel I shall make a lateral anastomosis, throwing the area of bowel with the stump of the diverticulum out of circuit.

Figure 6 shows a pin embedded in the wall of the diverticulum, also the densely adherent omentum.

The Association of Malignant Myomata with Meckel's Diverticulum

On April 15, 1919, Dr. Douglas Symmers, director of laboratories of the Bellevue and Allied Hospitals, sent me slides from a tumor removed from a man, 22 years old. This tumor had given rise to no symptoms and was accidentally discovered by Dr. Sweeny during an operation for hernia. The tumor was attached to the small intestine about 30 centimeters from the ileocæcal valve. Symmers said that the naked-eye appearances were those of a malignant tumor springing from the base of what appeared to be a Meckel's diverticulum.

Histologically, it suggested a myoma of the uterus undergoing sarcomatous transformation.

Symmers reported this case in the summer of 1919.[1]

He says: "For purposes of description, the specimen is divisible into two parts—an upper, rounded, and elastic to the touch, and a lower solid portion. On opening the upper part, it was found to consist of a pouch-like formation, lined on the inner side by a roughened, dirty-brownish, apparently structureless membrane. The lower portion consisted of a firm, whitish or cream-colored, irregularly lobulated growth, which completely encircled the base of the pouch-like dilatation by which it was surmounted, lobular prolongations from the growth extending upward into the walls of the diverticulum and gradually disappearing therein. On opening the mass, it was found that the walls of the diverticulum merged imperceptibly into a cuff-like tube, the lining of which was thrown into small transverse folds of apparently well-preserved mucous membrane. Projecting into the lumen of this portion of the intestine was a large, pale, firm, whitish tumor, covering the surface of which was a delicate membrane continuous with and presenting the same naked-eye appearances as the cuff of intestine by which the projection was surrounded. Externally the loop of intestine was reinforced by an irregularly lobulated growth, which, on section, presented a smooth, pale surface, where, at intervals, were reddish specks corresponding to injected blood sinuses."

An excellent picture of the gross appearance of the tumor accompanied Symmers' article.

Symmers further says, "I have been able to find but one case of like origin in the literature of medicine, that is to say, a malignant myoma or so-called myosarcoma of Meckel's diverticulum." He then cites the case observed by Kaufmann.

Symmers' conclusions are so instructive

[1] Douglas Symmers. The association of malignant myomata with Meckel's diverticulum. Ann. Surg., 1919, August, 183.

that I quote them in detail from the *Annals of Surgery*.

"1. Subserous, occasionally submucous, leiomyomata are encountered in the walls of the stomach, intestine, or gall bladder, in less than 1 per cent of autopsies. As a rule, they are solitary, rarely multiple. Seldom do they exceed a centimeter in diameter.

"2. Judging from the small number of cases to be found in the literature of malignant myomata of the stomach, intestine, and gall bladder, and comparing this with the number of subserous or submucous leiomyomata met with in corresponding situations in the routine performance of autopsies, the assumption seems reasonably justified that these apparently insignificant growths undergo transformation into malignant myomata with a degree of frequency which entitles them to attention as a potential source of danger. If accidentally encountered at operation, they should, I think, be removed.

"3. The majority of malignant myomata of the stomach, intestines, and gall bladder thus far reported were found in organs which otherwise appeared to be intact. In other and rare instances, however, these malignant growths bear a definite anatomical relationship to the developmental malformation of the intestine familiarly known as Meckel's diverticulum.

"4. The malignant myomata of the stomach, gall bladder, and intestine, including those associated with Meckel's diverticulum, are capable not only of extensive local expansion, but of widespread metastasis. Their degree of malignancy is apparently in excess of their prototype, the malignant myomata developing from smooth muscle tumors of the uterus."

UMBILICAL CONCRETIONS ASSOCIATED WITH INFLAMMATORY CHANGES IN THE ABDOMINAL WALL [1]

Many cases of umbilical infection owe their origin to an accumulation of foreign material in the umbilical depression. This causes irritation, the walls of the umbilicus swell and the umbilical opening then may apparently be of pin-point size. The clinical manifestations may, as in the following case, simulate an intra-abdominal lesion, whereas the process is extra-abdominal and limited to the umbilical area.

When an umbilical concretion is the cause of the trouble, it is merely necessary to dilate the umbilicus, curette away the concretion, remove any granulation tissue that may exist, and then treat the umbilical area as one would any other superficial infection. Umbilical infections form a most instructive group. In most cases concretions are responsible for the condition.

[1] Diseases of the Umbilicus, p. 247.

An Infection of the Umbilicus

Gyn. No. 21917. W. D., age 20, white, was admitted to The Johns Hopkins Hospital, January 6, 1916, complaining of an infection of the umbilicus and of pain in the lower abdomen.

Five years previously she had begun to have attacks of pain in the left lower abdomen. These would last for three or four days and were associated with some soreness and swelling in that region.

In January, 1913, the patient had a severe fall and injured her left side. The pain then grew worse and in August of the same year was present in both the right and left lower abdomen.

On August 15, 1915, she had an attack of appendicitis and on the following day experienced a burning sensation to the left of the navel which, after two days, became associated with some swelling at this point. The swelling at first was smooth, but in a few days became soft and fluctuant in the center, while around the softened area was a ring of hard indurated tissue. The lump to the left of the umbilicus became larger and on October 23 it ruptured, discharging a small amount of blood into the umbilical depression. Blood oozed out for two weeks. A week later the area began to burn and sting and for the next 3 weeks there was a bloody and purulent discharge from the umbilicus.

At the end of this time the swelling began to spread, and the umbilical region over an area as large as a saucer was indurated and discharged pus continuously. There was some fever. The pus gradually became thick and greenish. The discharge was of this character when the patient entered the hospital and for several weeks she had had chills and fever.

On her admission to the hospital an ulcerated area 5 centimeters in diameter was found at the umbilicus. This presented a crusty, reddish-yellow, scab-like appearance and entirely obliterated the normal umbilicus. Surrounding this was a zone of induration. The abdomen was everywhere tender especially in the right lower quadrant. The outlet was normal, the cervix small, the uterus larger than normal, and in retroposition. The fornices were clear. The white blood count was 8,400, hæmoglobin 83 per cent.

Operation, January 10, 1916. Under nitrous oxide anæsthesia I dilated the infected umbilicus with a Kelly clamp and a small amount of infected tissue was removed. The wound was dressed twice a day with iodine, and on January 23 alcohol sponges were applied. At this time there was no induration of the abdominal wall.

Second operation February 19, 1916. The cervix was dilated, the uterus was brought up into position, and the appendix was removed.

When the patient left the hospital on March 10, 1916, the umbilicus had the normal appearance but the surrounding skin was still somewhat discolored.

Gyn.-Path. No. 21812. The specimen consists of three small pieces of tissue removed from the umbilicus.

Histological examination. Bathing the umbilical cavity was purulent material, beneath which was a thin layer of granulation tissue containing young connective-tissue cells and polymorphonuclear leucocytes. Few capillaries were noted. This granulation tissue extended down for a short distance into the fibrous tissue as slender strands.

It will be noted that in this case we merely dilated the umbilicus and curetted away some inflammatory tissue. The chief thing was the stretching of the constricted umbilical opening so that the discharge could escape.

The subsequent abdominal operation revealed the fact that the inflammatory process had been confined entirely to the abdominal wall, the center of intensity being at the umbilicus itself.

A TUBERCULOUS ABSCESS OPENING AT THE UMBILICUS

Elsewhere I have described the subumbilical space[1] and referred to abscesses that may develop in this situation.

The following case suggested somewhat an ordinary abscess at this point, but the history and subsequent findings clearly indicate that the tubercle bacillus was at the bottom of the trouble. There was later probably a mixed infection.

I have reviewed the literature on tuberculous peritonitis followed by fæcal fistula at the umbilicus,[2] but in the accompanying case there was no escape of fæcal matter, and we were greatly surprised to find tuberculous peritonitis at operation.

We shall naturally find a tuberculous umbilical fæcal fistula only in the late stages of tuberculous peritonitis and then only when the intestine is extensively involved and has become adherent at the navel.

Gyn. No. 25386. G. T., age 25, was admitted to The Johns Hopkins Hospital on October 17, 1919, complaining of a discharge from the navel.

She became pregnant in May, 1918, and got along nicely until January, 1919, when she had pain in the right lower abdomen. She was delivered in February and nursed her baby for a while. She had some fever, occasional night sweats and felt bad.

On February 20, 1919, some swelling of the abdomen was noted and on March 6 an umbilical abscess ruptured.

When the patient entered the hospital there was slight abdominal distention, and exuding from the umbilicus was a greenish-grey, foul-smelling pus. Two inches above the umbilicus was an area of induration 4 centimeters in diameter. Pressure on this caused pus to escape from the umbilicus.

Operation, October 20, 1919. With a pair of Kelly forceps in the umbilical sinus as a guide I made an incision downward toward the symphysis, opening up an abscess cavity 6 centimeters wide and 4 centimeters deep. This cavity was packed with iodoform gauze and the abdominal incision partially brought together. The drainage gradually decreased and the cavity was from time to time irrigated with Dakin's solution. When she left the hospital on November 12, 1919, there was still induration around the umbilicus, and a profuse discharge.

From time to time the patient returned for dilatation of the sinus.

Gyn. No. 25666. The patient was readmitted on January 27, 1920. At this time there was a seropurulent discharge from the umbilicus, and thickening could be made out in the right vaginal fornix.

Operation, February 2, 1920. I excised the umbilical sinus, carefully walled off the intestines, removed the appendix, the tubes, and the left ovary.

Path. No. 25714. The appendix showed chronic inflammation. The fistulous tract was tuberculous. There was also tuberculosis of the tubes and of the left ovary. Tubercles were also scattered throughout the abdomen.

PROBABLE PSORIASIS OF THE UMBILICUS

This patient had a patch resembling psoriasis on his forehead and a similar area on the umbilicus. There is no reason why the navel should be exempt from psoriasis, if there are lesions elsewhere, but we have never noted it in this location before. This patient had appendicitis, and, as he was bothered by the umbilical discharge, we removed the umbilical area at the same time.

Mr. C. P. K., age 40, was referred to me by Dr. Charles L. Warner and admitted to the Church Home and Infirmary March 4, 1921. He had definite symptoms of chronic appendicitis and also complained of a periodic discharge from the navel.

On examination I found a reddening around the edge of the umbilicus particularly in the lower portion over an area 1 centimeter long and 1.5 centimeters broad (Fig. 7). It was thought that this reddened area might in some way be associated with a patch of psoriasis that the patient had on the forehead just at the junction of the hair.

Operation. We removed the umbilicus and found

[1] Diseases of the Umbilicus, p. 262.

[2] Ibid. p. 314.

the peritoneal surface at this point perfectly smooth. The appendix was removed and the small bowel carefully examined to see if by chance a Meckel's diverticulum existed.

Gyn.-Path. No. 26644. Sections from the outlying portions of the umbilicus show normal epithelium. As we approach the reddened area, the papillæ become longer, in some places reaching the surface, and at a few points project right through the epithelial covering. In the neighborhood of such points the epithelium, which appears horny and shows slight infiltration with small round cells, may be piled up as little elevations. The stroma immediately beneath the squamous epithelium in these areas is in places rarefied. There are young capillaries in such areas and they are surrounded by small round cells. In other places there are large aggregations of these small round cells in the stroma just beneath the epithelium.

It is quite possible that the red area at the umbilicus was identical with that noted on the forehead just at the junction of the hair. The clinical diagnosis of the area of redness on the forehead was psoriasis.

Fig. 7. Probable psoriasis of the umbilicus.

Gyn.-Path. No. 26644. The irregular dark area occupying about half of the lower margin of the umbilicus was reddish in color and was very similar to a patch on the patient's forehead. There was just a trace of a similar condition on the upper portion of the umbilicus. From the text it will be noted that many of the papillæ in the reddened area were unusually long and projected through the epithelium. The epithelium itself was here and there gathered up into the little tufts. These tufts consisted of dead epithelium. The stroma just beneath the epithelium, especially around the capillaries, showed much small round cell infiltration.

SYPHILITIC CONDYLOMA OF THE UMBILICUS

Syphilis of the umbilicus is rare. It is divided into two groups:

Syphilis of the umbilicus at or shortly after birth, and syphilis of the umbilicus in the adult.

One of the most interesting cases of syphilis of the umbilicus in the adult ever noted was the one observed by Fiaschi, of Sydney, Australia. I have described this case in detail elsewhere.[1] In addition to the primary chancre on the prepuce was a chancre at the umbilicus. The photograph of the umbilicus showed several dome-like elevations projecting from the floor of the navel, and trickling down the abdomen from the navel was a watery fluid. Spirochætæ were obtained from the umbilicus.

In November, 1916, I saw an interesting case of syphilitic condyloma of the umbilicus, with Dr. A. G. Rytina[2] at the Mercy Hospital, Baltimore. The history, as given by Dr. Rytina, is as follows:

"November 16, 1916. F. F., white, male, steelworker, complains of sores around anus. He has been in good health all his life. No previous venereal diseases, except a sore on penis 8 weeks ago, the incubation period of which was 9 days. The sore healed in a month under local treatment.

"Present condition. About 5 weeks ago the patient noticed a severe itching around the anus. This was followed in several days by the appearance of a number of sores which gradually became larger and more painful. During the past 2 weeks a warty mass has appeared around the anus. This is so painful and uncomfortable that the patient has no rest. During the past day or two the patient has had a burning and itching sensation in the umbilical region. This he attributes to an elastic belt which he wore, and which rose to the level of his navel. He also complains of a sore throat, and a sore on the inside of the lower lip.

"Examination reveals the external genitals normal, except for the presence of a small elevation on the right lip of meatus, and an indurated area on the left side of the penis near the frenum. Both these places are the remains of the original sites of infection, which were evidently two in number. No examination of these for spirochæta pallida had been made before they healed. The inguinal glands of both sides are enlarged and painless. Surrounding the anus there is a ring of condylomata, which, on microscopic examination, shows many spirochætæ pallidæ. A faint macular rash can be seen over the body. The right tonsil is covered by a mucous patch and a patch is seen on the inner side of lower lip. A cervical adenitis is present also.

[1] Diseases of the Umbilicus, p. 284.

[2] A. G. Rytina. Condyloma of the umbilicus. Am. J. Syphilis, 1918, ii, Jan.

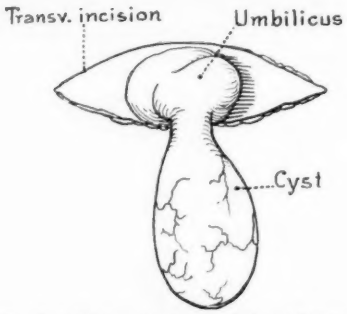

Fig. 8. An atheromatous cyst of the umbilicus.
This is a copy of the sketch made by Dr. Edwin Dargan Smith of Louisville, Kentucky, prior to his removal of the umbilical cyst. It was pear-shaped, measured 2 by 3 centimeters and was pedunculated. The overlying skin was thinned out and had branching blood vessels scattered over its surface. The cyst was filled with a pasty, pale, granular, and rather dry, material.

"Inspection of the umbilicus shows a slightly reddened area around it. On everting the umbilicus, three distinct, typical condylomata are seen. Microscopic examination shows many spirochætæ pallidæ.

"Treatment. The patient was given four intravenous injections of salvarsan of 0.3 gram each, at weekly intervals. On December 4 there was slight itching around the anus, but the pain had disappeared. The condylomata of the umbilicus were drying up. On December 12 the condylomata of the anus were almost dried up and no longer caused discomfort. The condylomata of umbilicus were dry and smaller. At present lesions have all cleared up."

Dr. Rytina, in summing up the essential points in the case, says: "The most interesting feature of the case is the wearing of the belt around the umbilicus, the irritant action of which was undoubtedly the predisposing factor in the production of the lesion. The diagnosis of the lesion was easily made by its typicalness, being exactly similar to the condylomata ani, which the patient also had. The certainty of its luetic nature was demonstrated by the presence of the spirochæta pallida and its rapid disappearance after the institution of antisyphilitic treatment."

BLUISH DISCOLORATION OF THE UMBILICUS AS A DIAGNOSTIC SIGN IN RUPTURED EXTRA-UTERINE PREGNANCY

In 1919[1] I reported, and Max Broedel illustrated, a new sign that may prove of value in the diagnosis of some tubal pregnancies where the abdomen contains an abundant quantity of free blood. If the hæmorrhage has been a sharp and severe one, the clinical symptoms are so evident that operation is at once undertaken. But occasionally the bleeding has evidently been slow but persistent. In such cases the abdomen may accumulate a large quantity of blood without the patient having given any evidence of shock.

In such a case the umbilicus may in some manner imbibe the blood and appear bluish black, so that in time we get the same play of colors at the umbilicus that one does with a black eye—the greens and yellows.

On March 21, 1918, there entered the Church Home and Infirmary a thin wiry woman (C. H. I. 18744), who looked to be nearly 60 years of age but who was actually only 38. She was the mother of seven children. For 3 weeks she had had pain in the right lower abdomen with intermittent attacks of abdominal distention. One week after the onset of the trouble the umbilical region suddenly became bluish black, although there had been no injury in this region. Pelvic examination was very unsatisfactory on account of the marked abdominal distention.

Operation, March 27, 1918. With the patient asleep the uterus was found to be slightly enlarged. To the right of the uterus was a freely movable mass, about 8 centimeters long by 5 centimeters broad.

Prior to opening the abdomen I dictated the following note: "The bluish-black appearance at the navel unassociated with any history of injury, together with the mass to the right of the uterus, makes the diagnosis of extra-uterine pregnancy relatively certain, although the patient has not missed any period and although there has been no uterine bleeding."

On opening the abdomen I found it filled with dark blood and attached to the fimbriated end of the right tube was an extra-uterine pregnancy. It was possible to remove this without sacrificing the tube.

The bluish discoloration gradually diminished in intensity during the patient's sojourn in the hospital prior to operation, and disappeared completely within a few days after operation. The gradual change in color that took place in the umbilical region reminded one strikingly of the changes in color that occur in a black eye resulting from a blow.

I recorded this case in order that subsequent ruptured extra-uterine pregnancies may be examined for this sign. Whether it will prove to be of common occurrence or very rare, I cannot say, but we shall naturally expect it only where there is free blood in the

[1] Thomas S. Cullen. Bluish discoloration of the umbilicus etc. Contributions to Medical and Biological Research, Dedicated to Sir William Osler, in honor of his seventieth birthday, July 12, 1919, by his pupils and co-workers.

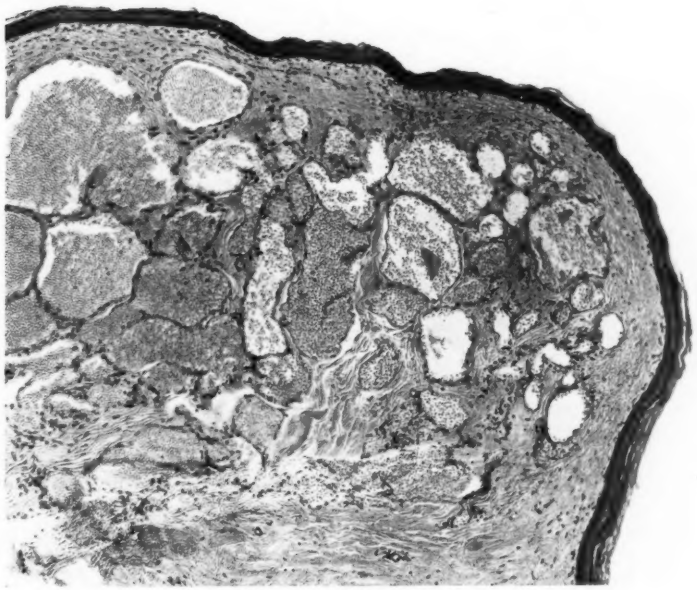

Fig. 9. A small umbilical Nævus.
C. H. I. No. 20561. Gyn.-Path. No. 24661. This is a section of the small reddish blue nævus seen in Plate I, D. The squamous epithelium is somewhat thinned out. The blood vessels of the nævus are large, have very thin walls, and many of them have little or no intervening stroma.

abdomen, and shall probably be more likely to encounter it in thin individuals.

Dr. Emil Novak, who is associated with me in our laboratory work, has recently had two cases presenting this sign. These he reported in the *Journal of the American Medical Association*, 1922, lxxviii, 643. Recently a similar case has been recorded in the *Centralblatt fuer Gynaekologie*.

ATHEROMATOUS CYSTS OF THE UMBILICUS

In a survey of the literature[1] I noted six genuine instances of atheromatous cysts of the umbilicus. The major portion of those reported seemed to be cases of umbilical infections with concretions and not atheromatous or dermoid cysts.

During the last 5 years I have observed three cases, one at The Johns Hopkins Hospital; Dr. H. H. Hampton, then resident surgeon at the Hebrew Hospital, removed the second; and the specimen of the third case was sent me by Dr. Edwin Dargan Smith, of Louisville, Kentucky. In Dr. Hampton's and also in Dr. Smith's case the condition was noted at or shortly after birth. In our case no mention was made of any umbilical trouble until the patient was 18 years old.

These tumors may spring from the umbilical depression or from the wall of the umbilicus; they are usually pedunculated, may reach three or more centimeters in diameter, are covered with skin, are usually flaccid, are thin-walled, have smooth inner surfaces and are filled with grumous or crumbly material.

They are lined with a more or less well-developed squamous epithelium, and are devoid of hairs and sebaceous and sweat glands.

Histological examination of the cyst contents shows exfoliated squamous epithelium, fat droplets and frequently cholesterin crystals. These cysts are easily removed.

[1] Diseases of the Umbilicus, p. 366.

Fig. 10. Papilloma of the umbilicus.

This photograph together with a slide was sent me by Dr. N. B. Carson of the Barnard Free Skin and Cancer Hospital, of St. Louis, Missouri. St. Louis No. S15165. The entire umbilicus is involved in the papillomatous growth which extends well above the surface of the abdomen. At some points it is wider than at others. The surfaces of the papillary masses were covered by many layers of squamous epithelium, the superficial layers of which were hornified. Here and there between epithelial cells were polymorphonuclear leucocytes, many of them eosinophilic. Immediately beneath the epithelium there was a very active inflammatory reaction, young connective-tissue cells, small round cells and polymorphonuclear leucocytes being present. Beneath this, again, was the characteristic stroma of the part. There was no evidence of malignancy. This is the first specimen of this kind that I have ever seen.

In the Emmett operation for perineal repair a wide removal of the vaginal mucosa is made. Occasionally a small piece of vaginal mucous membrane has been overlooked, and when the parts were approximated this has been carried into the depth of the perineum. This in time may form a small cyst filled with grumous material. I have pictured a vaginal cyst of this character.[1]

Similar cysts undoubtedly occasionally occur where a small loose piece of vaginal mucosa is accidentally buried when the perineal repair is done immediately after labor.

We are thoroughly familiar with the remnants of the omphalomesenteric duct that are not infrequently noted at the navel, and with the gradual closing in of the abdominal walls, finally culminating in the formation of the umbilicus. It is quite possible that a small piece of attenuated skin of the umbilical scar might become buried in this region. This would very naturally in time produce a small atheromatous cyst.

[1] Thomas S. Cullen. Vaginal cysts. Johns Hopkins Hosp. Bull., 1905, p. 211 (Figs. 8 and 9).

An Atheromatous Cyst of the Umbilicus

Gyn. No. 21957. E. T., aged 20, entered The Johns Hopkins Hospital March 20, 1916, complaining of backache and of pain in the lower abdomen. For 2 years she had had occasional attacks of abdominal pain usually near the umbilicus, and radiating to the flanks.

Protruding from the umbilicus was a rounded lobulated, soft tumor about 3 by 1.5 centimeters. This sprang from the umbilical depression and from the abdominal wall directly below it, by a delicate pedicle. Dr. Kelly removed the umbilicus together with the cyst.

Gyn.-Path No. 22003. The specimen consists of an oval piece of skin containing in its center the umbilicus. Arising from the lower margin of the umbilicus by a pedicle 1 centimeter in diameter is a cyst 3.5 centimeters in diameter. This is covered by skin. It contains sebaceous-like material.

Even without a microscopic examination the specimen presents the typical picture of an atheromatous cyst of the umbilicus.

An Atheromatous Cyst of the Umbilicus

On November 1, 1917, M. S., a small boy entered the Hebrew Hospital and came under the care of Dr. H. H. Hampton, who sent me the specimen and the history of the case.

This boy since birth had had a small tumor which hung down from the umbilicus by a well-defined pedicle. The tumor was soft, had a semisolid consistency and apparently had altered little in size for a considerable period.

Operation by Dr. Hampton. The cyst was readily removed. There was apparently no direct connection between it and the peritoneal cavity.

Gyn.-Path. No. 23463. The tumor is whitish in color, is oval, measures 3.4 by 2.7 by 1.7 centimeters and is definitely cystic. Its walls vary from 0.5 to 1 millimeter in thickness. When a small hole was made in it, a sebaceous-like material escaped.

No perfectly satisfactory sections of the cyst could be obtained, as the tissue was very brittle and did not cut well. The walls were composed of connective tissue, poor in nuclei. The inner surface of the cyst was lined with an imperfect squamous epithelium. The deep layer was cuboidal, and superimposed on it were five or six layers of ill-defined squamous epithelial cells.

The growth was evidently an atheromatous cyst.

An Atheromatous Cyst of the Umbilicus

Dr. Edwin Dargan Smith of Louisville, Kentucky, on November 21, 1918, sent me a

report of an interesting umbilical cyst he had recently removed, together with portions of the specimen.

The patient, a school boy of 11, came under Dr. Smith's care on November 7, 1918. A few weeks after birth a small growth appeared at the umbilicus. The tumor grew only slowly until six years ago but after that gradually increased in size. It was covered with skin, had the consistency of a lipoma, was pear-shaped, measured approximately 2 by 3 centimeters and was attached to the umbilicus by a pedicle measuring about 3 by 8 millimeters. The overlying skin was thinned out, had small branching blood vessels scattered through it and would slide readily over the growth (Fig. 8). There was no pain referable to the umbilicus.

Operation, November 8, 1918. A transverse incision was made embracing the umbilicus, as in the Mayo operation, and the umbilicus removed. The inner surface of the navel was perfectly smooth. The appendix was removed, and a slight physiological intussusception was easily reduced. The boy was discharged November 17.

Dr. Stuart Graves, pathologist of the Louisville City Hospital, found that the cyst contained a cavity, 1 centimeter in diameter. It was filled with a pasty, pale, granular, and rather dry material. This material under the high power was found to be crystalline in nature. It dissolved in a mixture of absolute alcohol and ether. Dr. Graves found it impossible to get satisfactory sections of the cyst wall, and we had the same trouble.

The cyst was lined with what looked like an embryonic epithelium apparently of the squamous cell type. In some places this was two or more layers in thickness. The nuclei were oval and vesicular, but the individual cells were not well differentiated. At other points, there was a well-defined squamous epithelium, several layers thick, and covering the surface of this was what appeared to be an ill-defined horny epithelium.

Undoubtedly this was a small atheromatous cyst of the navel.

ADENOMYOMA OF THE UMBILICUS

Adenomyoma of the umbilicus is a definite clinical entity. Elsewhere[1] I have considered the subject fully and have discussed the literature.

These growths naturally occur only in women. They are small, occasionally swell up at the menstrual period and sometimes cause a slight escape of blood from the umbilicus during the period.

Histologically, they consist of non-striped muscle and fibrous tissue with uterine mucosa

[1] Diseases of the Umbilicus, p. 373.

Fig. 11. Small pseudomucinous cysts of the umbilicus secondary to a large pseudomucinous cyst of the ovary.

C. H. I. No. 19252. Gyn.-Path. No. 24072. Occupying the upper part of the umbilicus are several small cysts. The umbilicus and the large ovarian cyst and the free pseudomucinous fluid in the abdominal cavity were removed.

scattered here and there throughout the nodule.

Recently two further cases have come under my notice. These were published in detail in the *Archives of Surgery*, 1920, vol. i, 279.

SMALL NÆVUS OR HÆMANGIOMA OF THE UMBILICUS

Small nævi of the skin are relatively common, but in only one instance have I ever noticed a nævus at the umbilicus. Histologically, it was similar to those found in the skin. Under ordinary circumstances no attention would have been paid to it, but the patient worried about its presence, and as he had some discharge from the umbilicus we removed the entire umbilical area.

C. H. I. No. 20561. H. E. S., 50 years of age, was admitted to the Church Home and Infirmary early in January, 1919. He was perfectly well, except that he complained of some discharge from the navel. The umbilical mamelon projected somewhat and springing from its surface was a small, bluish red nodule about 3 millimeters in diameter (Plate I, D). This seemed to be a nævus.

Operation, January 14, 1919. As the umbilical discharge worried the patient considerably, we thought it wiser to remove the area. This was done. The wound healed by first intention.

Gyn.-Path. No. 24661. The squamous epithelium over the small, bluish red mass is only two or three layers in thickness. Immediately beneath

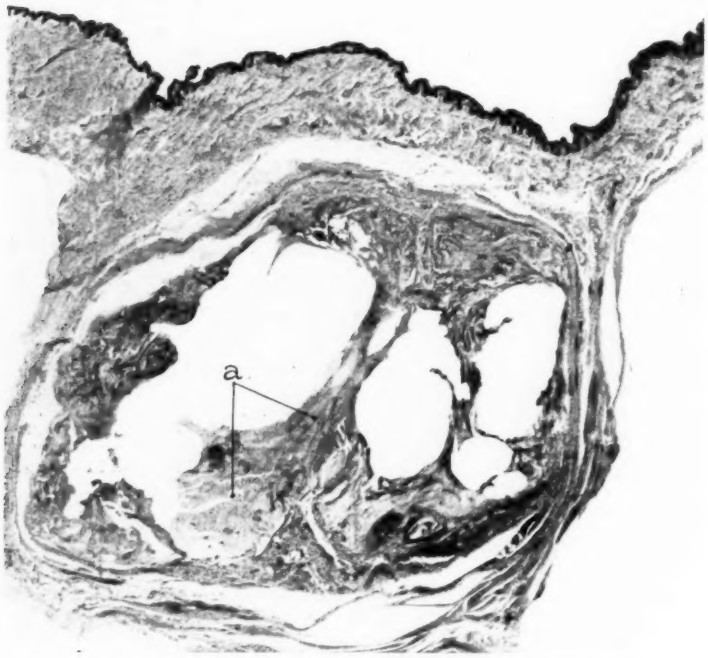

Fig. 12. Small pseudomucinous cysts at the umbilicus, secondary to a large pseudomucinous cyst of the ovary.

C. H. I. No. 19252. Gyn.-Path. No. 24072. The squamous epithelium at the umbilicus is unaltered. Below this is an irregular, spherical area made up of small cysts. Lining a few of these was an ill-defined epithelium, and in the surrounding fibrous tissue were bluish areas where small glands had formerly existed. Most of the epithelium has melted away into pseudomucinous fluid. Coagulated pseudomucinous fluid is well seen at *a*. For the gross appearance of the umbilicus at operation see Figure 11.

this is a narrow zone of fibrous tissue, beneath this again are large quantities of blood vessels lined with one layer of endothelium, and often lying one against the other with no intervening stroma (Fig. 9). If the blood were removed, the spaces with the delicate intervening stroma would bear a striking resemblance to lung tissue. The line of demarcation between the blood vessels and the underlying fibrous tissue is sharply defined.

The picture is that of an angioma. Clinically, it is of little significance. Histologically it is very interesting.

MOLES OF THE UMBILICUS

On one or two occasions I have noted small pigmented moles in the umbilical depression, or along its side. Dr. Leo Brady, resident gynecologist, Johns Hopkins Hospital, has also noted them. They have occasioned no trouble.

PAPILLOMA OF THE UMBILICUS

The literature on this subject I have collected and published in my *Diseases of the Umbilicus*, p. 360.

On September 20, 1916, Dr. N. B. Carson of the Barnard Free Skin and Cancer Hospital, St. Louis, Missouri, sent me a photograph and slides of a papilloma of the umbilicus. This case was published in the *Annals of Surgery*, February, 1917, p. 199.

The patient A. C., male, white, age 77, was admitted to the hospital on October 25, 1915. He had always done outdoor work, gave no history of lues, and, apart from one attack of jaundice several years before, had always been in good health.

About a year before admission the patient noticed a small mass the size of a "dime" at the umbilicus. There had been no history of injury. The mass

never ulcerated and occasioned little pain. Recently it had increased in size.

On admission the picture presented in Figure 10 was found. At the umbilicus was a hard irregular indurated mass surrounding the umbilical opening. There was no ulceration. The growth appeared to extend deeply, but did not seem to invade the surrounding tissue. Dr. Carson said that there was no evidence of hernia nor of any abdominal masses. The liver was about four fingers' breadth below the costal margin. Examination of the rectum was negative.

Operation. Under 1 per cent novocaine, an elliptical incision, about 5 centimeters in length including the tumor, was made across the abdomen, and carried down to the peritoneum. The tumor did not extend into the abdomen, but seemed to be limited to the umbilicus. The omentum was, however, adherent at this point. Exploration of the abdomen failed to reveal anything abnormal.

The patient made an uneventful recovery.

Dr. Carson said: "The tissue consists of an elliptical piece of skin 4 by 8 centimeters, which surrounds a papillomatous growth, 2 by 2 centimeters. The surface of the growth is irregular, not ulcerated, and the growth extends down along the umbilical tract. It seems to be fairly well encapsulated. It does not seem to invade the surrounding tissue."

On examination of the slides kindly sent to me by Dr. Carson I found that the growth was a papilloma. The papillary masses were everywhere covered over by many layers of squamous epithelium, the superficial portions of which were hornified. Scattered here and there between the epithelial cells were small round cells or polymorphonuclear leucocytes, many of which were eosinophiles. The connective tissue immediately beneath the epithelium showed a very active inflammatory reaction, young connective-tissue cells, small round cells, and polymorphonuclear leucocytes being present. The central stems of the papillary masses consisted of fibrous tissue.

The picture is that of a typical papilloma springing from the squamous epithelium.

Fig. 13. Portions of pseudomucinous cyst of the ovary. C. H. I. No. 19252. Gyn.-Path. No. 24072. In the lower part of the specimen is the fibrous tissue of the cyst wall containing numerous small round cells. At *a* is a remnant of cuboidal epithelium. At *b* are projections of fibrous tissue which other sections indicate were at one time covered by epithelium. At nearly all points the epithelium has melted away into the sticky material which stains blue with hæmatoxylin. This is the usual picture in these pseudomucinous cysts.

SMALL UMBILICAL CYSTS SECONDARY TO A PSEUDOMUCINOUS CYST OF THE OVARY

By some pseudomucinous cysts of the ovary are looked upon as benign, by others as malignant. I think if we take a position midway between these two views we shall be nearer the mark.

When we follow the clinical course of these cases, we note that in some there is a rapid return of the growth, in others, years may elapse before a second operation is necessary.

In the following case, at the time of operation, several small pseudomucinous cysts were found at the umbilicus. Histologically, these were identical in character with the large ovarian tumor.

This is the only instance, so far as I know, where a pseudomucinous cyst of the ovary was accompanied by umbilical cysts of the same type. They were, of course, secondary.

C. H. I., No. 19252 Mrs. M. D. of Knoxville, Tennessee, came to see me on May 27, 1918, complaining of marked abdominal enlargement.

She had never had any children. Her menses had ceased suddenly at the time of the Baltimore fire (1904) and never reappeared. She was 37 at that time. In 1900 she had had peritonitis and was ill 7 weeks.

Her abdominal enlargement dated back about 2 months. For the last 2 weeks she had had a bronchitis. The abdomen was uniformly and markedly distended and there was a most unusual picture at the navel (Fig. 11). The upper part of the umbilical

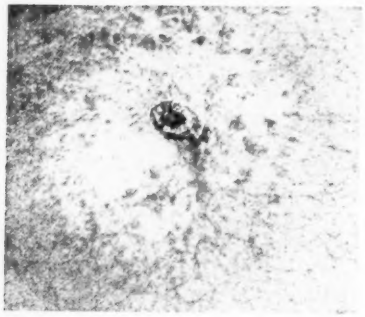

Fig. 14. Epithelioma of the umbilicus emanating from an extensive atrophic scar following a severe roentgen-ray burn. (After Heidingsfeld.)

rim had been replaced by a small cyst, on the top of which was a second cyst, and projecting from the umbilical depression there appeared to be a third cyst.

Pelvic examination was unsatisfactory, as the abdominal growth seemed to have pulled the pelvic structures up into the abdomen.

Operation, June 4, 1918. On opening the abdomen we found quantities of free colloid material. This was removed as far as feasible. We then took away a large pseudomucinous cyst of the right ovary. The appendix was twice the natural size and also thickened.

The peritoneal surface of the umbilicus was perfectly smooth. The patient's recovery was uneventful.

May 2, 1921. Mrs. D. came to see me today—'dropped in to let me see how well she was.' For some time after operation she had pain in the gall-bladder region. At present she has no discomfort at all, feels perfectly well, does her own washing and ironing and looks the picture of health.

The specimen consists of a large mass of material which has evidently been an ovarian cyst. This has apparently ruptured before operation. It is made up chiefly of large cystic cavities filled with gelatinous-like material. In some of the cysts this material is dark reddish brown in color, in others grayish brown, and in some the cyst content is yellowish white. The entire picture suggests a pseudomucinous ovarian cyst of large proportions.

The umbilicus contains several small cysts as indicated by Figures 11 and 12.

Gyn.-Path. No. 24072. The cyst was in some places lined with a low epithelium (Fig. 13 at *a*), but at most points this had melted away and we had a material that stained rather bluish with hæmatoxylin. The picture was that of a typical pseudomucinous cyst. At the umbilicus the small cysts were similar in character (Fig. 12), and one sees in the connective tissue little bluish areas where all trace of the epithelium has already disappeared. The general picture is that of a typical pseudomucinous cyst.

CARCINOMA OF THE UMBILICUS

In my *Diseases of the Umbilicus*, p. 400, carcinoma of the umbilicus was fully considered and abstracts of the more important cases were given. As a result of the analysis I made the following classification:

A. Primary umbilical carcinoma: (1) squamous-cell carcinoma; (2) adenocarcinoma.

B. Secondary umbilical carcinoma: (1) from the stomach; (2) from the gall bladder; (3) from the intestine; (4) from the ovaries; (5) from the uterus; (6) from other abdominal organs.

Primary Squamous-Cell Carcinoma of the Umbilicus

Primary squamous-cell carcinoma of the umbilicus is very rare. In my book (p. 402) are recorded three cases from the literature that might possibly belong to this group.

Heidingsfeld[1], professor of dermatology in the University of Cincinnati, in a very interesting article entitled "Etiologic Rôle of Scar Tissue in Skin Cancer" gives a good picture of an epithelioma of the umbilicus, in the center of an extensive atrophic scar following a severe roentgen-ray burn.

Carcinoma of the Umbilicus Secondary to Carcinoma of the Stomach

From a study of the literature[2] it is evident that, where secondary carcinoma of the umbilicus develops, the primary growth has been most frequently noted in the stomach.

On November 13, 1917, Dr. Frank Warner, of Columbus, Ohio, wrote me saying that he had just seen a case of carcinoma of the pylorus with a secondary growth at the navel.

The patient was a man 54 years old. Nineteen years before he had had symptoms indicating gastric ulcer. For 6 months before admission he had had gastric symptoms. At the time of his admission to the hospital there was a hard, red, firm mass at the umbilicus. This was tender on pressure. It had not ulcerated. At the pyloric end of the stomach was a large hard mass, not very freely movable.

The entire umbilicus was removed, but the stomach growth was too extensive to permit of a radical operation.

The umbilical growth was an adenocarcinoma.

[1] J. Am. M. Ass., 1916, Nov. 18, 1502. Fig. 6. I have taken the liberty of reproducing Heidingsfeld's picture that appeared in the *Journal of the American Medical Association*.

[2] Diseases of the Umbilicus, p. 412.

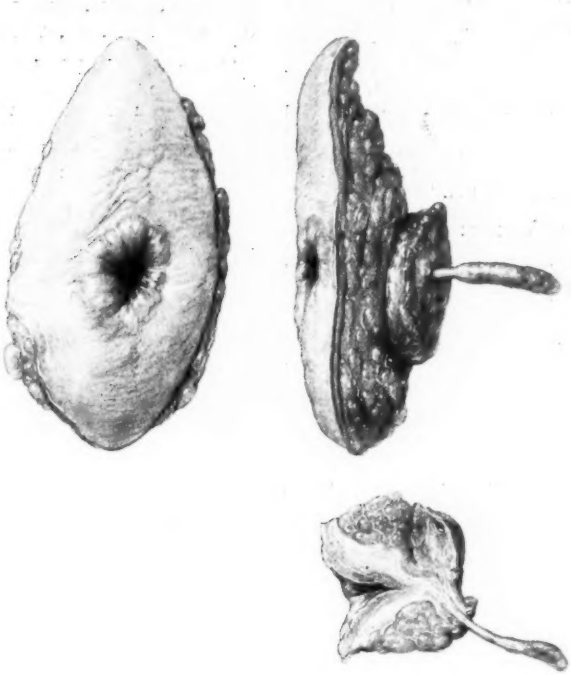

Fig. 15. Adenocarcinoma of the umbilicus, probably secondary.

Gyn.-Path. No. 25172. Specimen sent by Dr. Donald Guthrie of Sayre, Pennsylvania. The umbilical margins are raised and in the central portion was some ulceration. The drawing to the right shows that the peritoneal surface was smooth, but that a small vessel passed from that point. The lower picture shows the apparent fibrous character of the umbilical depression. From this one would hardly think that a carcinoma existed. On microscopic examination it was found that the squamous epithelium in the umbilical depression had at some points disappeared and that the surface was covered with polymorphonuclear leucocytes. The growth was an adenocarcinoma, with areas suggesting colloid. Whether it was primary or secondary is not absolutely clear.

undoubtedly secondary to the carcinoma of the pylorus.

The case is reported in detail elsewhere.[1]

Carcinoma of the Umbilicus Secondary to Carcinoma of the Intestine

Carcinoma of the umbilicus secondary to malignant growths in the intestine is rare (see *Diseases of the Umbilicus*, p. 425).

On September 25, 1916, I received the following letter from Dr. M. G. Wohl, pathologist of the Nicholas Senn Hospital. "I am sending you under separate cover two slides from an umbilical malignant growth. Will you be kind enough to express your opinion upon them?

The history of the case is as follows:

"Mrs. C., age 60 years. She had always enjoyed good health. For the past 6 months she had noticed a lump in the umbilical region. This annoyed her but caused no pain.

"Upon examination nothing abnormal was found except a protruding mass at the umbilicus which was adherent to the underlying tissues.

"Operation disclosed a mass the size of a child's

[1] Frank Warner. Carcinoma of the umbilicus. Surg., Gynec. & Obst., 1918, xxvii, 204.

head surrounding the umbilicus; this had pushed the peritoneum into the abdomen and had entirely displaced the recti muscles. It was firmly adherent to the transverse colon. The tumor was removed together with 8 inches of transverse colon.

"The patient died of peritonitis. No postmortem was obtained, but at operation the stomach was found to be normal. There was, however, a nodule the size of a duck's egg in the sigmoid. It had the appearance of an adenocarcinoma."

My report was as follows:

The sections show adenocarcinoma in some places of a well-defined gland type; in other places the growth is more cellular, there is less stroma and there is a definite tendency for the epithelium to form solid nests.

Whether the primary growth was in the sigmoid or transverse colon cannot be determined with certainty. There was no opportunity to examine the rectal growth. Since then Wohl[1] has reported the case.

Carcinoma of the Umbilicus Secondary to Carcinoma of the Rectum

Carcinoma of the umbilicus following carcinoma of the rectum is rare. Frank Warner, in 1918[2] reported the case of a man of 68, who for a year or more had had occasional attacks of pain and soreness in the rectum, associated with attacks of diarrhœa followed by constipation.

At the umbilicus was a mass 1 inch in diameter. This was hard and fixed to the deeper structures.

At autopsy 2 months later the rectum was found almost occluded by a scirrhous mass.

Microscopic examination showed that the primary growth was in the rectum and that the umbilical tumor was secondary.

The report is well worth a careful reading.

Probably Secondary Carcinoma of the Umbilicus—Primary Source Undetermined

In the accompanying cases the umbilical growth was an undoubted carcinoma, but no opportunity was afforded to determine whether the growth was primary or secondary. As primary adenocarcinoma of the umbilicus is very rare, they are included among the secondary growths.

Adenocarcinoma of the Umbilicus Probably Secondary

On July 2, 1919, I received a letter from Dr. Donald Guthrie of the Robert Packer Hospital, Sayre, Pennsylvania. He had just operated on F. H., a man 69 years of age.

The patient had had soreness in the umbilical region since Christmas, 1918. The hard lump about the umbilicus had grown slowly and there had never been any bleeding, discharge, or pain. For the gross appearance of the umbilicus see Figure 15.

Dr. Guthrie said: "From exploration at the time the abdomen was opened I am satisfied there were no metastases from the liver."

Gyn.-Path No. 25172. The surface of the section is in places covered over by normal skin, at other points this has disappeared, and there is a necrotic growth covering the surface. The superficial portion of this shows marked polymorphonuclear infiltration and the shadows of glands. In the depth is a typical adenocarcinoma, the gland type being particularly well preserved. At some points the gland epithelium tends to melt away and one gets the idea of a colloid growth. In the deeper portions the glands are much larger and the tendency toward colloid is even more marked.

It is impossible to tell where this carcinoma started; it apparently is secondary. The growth is undoubtedly malignant and the outlook is not good.

Adenocarcinoma of the Umbilicus Probably Secondary

Dr. Caroline McGill, on November 29, 1920, sent me an umbilicus from the Murray Hospital, Butte, Montana.

The patient, Mrs. G., 45 years of age, 4 years before, had fallen, striking the abdomen. For 3 months she had felt a small mass at the navel. Two weeks before admission it broke down forming an ulcer. It was unassociated with pain.

When the patient was first seen on November 2, 1920, she had a wide open umbilicus. Her past history was negative except for the fact that for 3 or 4 months she had had polyuria and polydipsia.

The patient was rather obese, had bad teeth, and varicose veins of both legs. The urine contained 2 per cent of sugar. She was put to bed and given a diabetic diet. In 3 days the sugar had disappeared.

Operation by Dr. T. C. Witherspoon. The umbilical ulcer together with a wide area of fat and skin were removed under local anæsthesia. Frozen sections made at the time (Dr. McGill tells me) showed adenocarcinoma. Two weeks after operation the patient was given radium and advised to come back for radium treatment later.

Gyn.-Path. No. 26364. The specimen consists of a small umbilicus together with a good deal of the surrounding adipose tissue. The umbilical depression is 5 millimeters deep. It is rather difficult to determine just what the ulcer was like because the specimen has been in hardening fluid for some time. The tissue immediately beneath the umbilical

[1] M. G. Wohl. Carcinoma of the umbilicus. Boston M. & S. J., 1917, clxxvii, 442.

[2] Frank Warner. Carcinoma of the umbilicus. Surg., Gynec. & Obst., 1918, xxvii, 264.

depression shows what appears to be an irregular, fibrous transformation. The firm tissue beneath the umbilical depression is at least 1.5 centimeters thick and strands of this fibrous-looking tissue extend into the underlying fat. This is the picture that one usually finds with carcinoma of the umbilicus, and when the tissue is cut into, one would not for a moment get the impression that he was dealing with a carcinoma.

The skin of the umbilicus at the margin of the ulcer shows little or no change. The surface of the ulcer is covered by polymorphonuclear leucocytes and in some places are glands extending right up to the surface. The firm fibrous-looking area at the umbilicus is composed of fibrous tissue with quantities of glands scattered throughout it. Some are small, others rather large; nearly all are lined with one layer of cylindrical epithelium. Where the glands are dilated, some of them are filled with polymorphonuclear leucocytes and the gland epithelium is thinned out, becoming cuboidal or almost flat. In the depth some of the glands are minute. The picture is that of a typical adenocarcinoma. It is probably secondary, as primary adenocarcinoma is exceptional. It is, of course, as yet impossible to tell where the original tumor was.

A Malignant Abdominal Growth with a Secondary Nodule Just Above the Umbilicus

From the appearance at operation it was perfectly clear that the abdominal growth was malignant. Much as we desired to know the exact character of this growth, removal of a piece of the tissue would have added to the risk and consequently we refrained from excising any. The probabilities are that the tumor was carcinomatous. The umbilical growth was undoubtedly secondary to that occupying the abdomen.

C. H. I. No. 16098. Mrs. A. C., age 73, was admitted to the Church Home and Infirmary, late in May, 1917. Her abdomen was markedly distended. On account of dyspnœa it was thought wiser to let her rest in bed for a few days before operation.

Operation, June 2, 1917. Situated just above and slightly to the right of the umbilicus was a hard plaque of tissue, about 3 centimeters in diameter and raised about 2 millimeters above the general surface of the abdomen (Fig. 16). The umbilicus itself was slightly indurated.

The growth in the umbilical region, coupled with the marked abdominal enlargement, at once suggested a malignant abdominal growth with a metastatic tumor at the umbilicus.

We made a very small mid-line incision below the umbilicus and let out quantities of ascitic fluid. The omentum had been converted into a solid mass at least 6 or 8 centimeters thick, and nodules were found scattered throughout the abdomen.

Fig. 16. A malignant abdominal tumor with a secondary growth at the umbilicus.

C. H. I. No. 16098. Mrs. A. C. May, 1917. The abdomen contained much ascitic fluid. The omentum had been converted into a solid mass over 6 centimeters thick. Nodules were found scattered through the abdomen. No attempt was made to locate the original tumor. At the point indicated by the dotted line was an indurated and raised secondary growth which reached the upper umbilical margin.

We did not attempt to find the original source of the trouble, as we deemed it best to let the patient go home at the earliest possible moment.

SECONDARY SARCOMA OF THE UMBILICUS

Sarcoma of the umbilicus whether primary or secondary is very rare (see *Diseases of the Umbilicus*, p. 449).

The following case is the only one in which I have had the opportunity of examining sections. The growth was a perithelial angiosarcoma (Fig. 17).

On June 14, 1921, Dr. F. C. Warnshuis of Grand Rapids, Michigan, saw Mrs. B., age 45, who for the past 2 years had noticed a peculiar enlargement and hardening of the navel. This was tender at times. The center of the umbilicus was soft, and her family physician told her that she had a small umbilical hernia. She wore a truss for a time, but discarded it on account of the pain it occasioned.

About the middle of March, 1921, her abdomen commenced to increase in size and, when Dr. Warnshuis saw her, it was markedly enlarged. For the preceding 2 weeks she had had increasing distress from the distention, with dyspnœa.

Fig. 17. Secondary sarcoma of the umbilicus.

Specimen sent by Dr. F. C. Warnshuis. Gyn.-Path. No. 27169. This is a very low power picture of the sarcoma. At the right the picture shows oval or round white spaces surrounded by dark zones. The white spaces are blood vessels and the dark zones consist of sarcoma cells. In other words this part of the growth presents the typical appearance of perithelial angiosarcoma.

She had had five children. Her only previous illness had been typhoid fever when she was 20 years of age.

On examination the abdomen was found markedly enlarged and tense. It was symmetrical and suggested the picture of a large ovarian cyst. The umbilicus was indurated, but in its center was a small hernia.

Operation, June 14, 1921. On opening the abdomen Dr. Warnshuis found the bowel, mesentery, and omentum adherent to papillary masses. There were secondary growths in the liver, and enlarged mesenteric glands. The abdomen contained little fluid. As nothing could be done, the umbilicus was excised and the abdomen closed.

The patient died in 36 hours, apparently of shock coupled with pulmonary engorgement.

In answer to a further query, Dr. Warnshuis, under date of October 28, 1921, says: "I am sorry that it was not possible to secure a postmortem, because then we would have been able to determine from just what structures the sarcoma arose. From the physical examination and from the apparent density of the mass in the pelvis I would advance the conjecture that it arose from the ovary."

Gyn.-Path. No. 27169. The specimen which consists of the umbilicus with a little of the surrounding skin is 3 centimeters long, 2 centimeters broad. It consists in large measure of a tumor springing from the umbilical depression. The tumor measures 2.3 by 2 centimeters and the overlying skin is stretched and smooth. The tumor on section appears uniform, is rather soft, is somewhat porous and differs entirely in texture from those secondary growths usually found at the umbilicus. The latter are invariably hard and fibrous-looking.

With the low power one sees a very cellular growth embedded in a small amount of loose stroma. At many points it is perfectly evident that the growth is arranged around vessels, and we see longitudinal or cross sections of them (Fig. 17). The blood vessels are small, have very thin walls and are surrounded by spindle cells. These are cut either longitudinally or transversely: sometimes the spindle cells appear to run parallel with the long axis of the vessel, sometimes transversely. The more solid portions of the growth present the usual picture of a spindle-cell sarcoma. There has been some hæmorrhage into the growth in the past, as evidenced by the fact that quite a number of the cells have taken up yellowish brown granular pigment. There is also considerable œdema and liquefaction. The growth is a perithelial angiosarcoma.

This is the first sarcoma of the umbilicus that we have encountered. From what Dr. Warnshuis said, it was impossible to determine with certainty the source of the original tumor, but he came to the conclusion that it was in all probability from the ovary.

AN AMNIOTIC UMBILICUS[1]

This condition is characterized by an absence of the skin around the umbilicus, the defect being replaced by amnion which is reflected upon the abdomen from the cord. In such cases the surrounding abdominal wall is usually intact.

On July 2, 1919, Dr. Margaret Tyler, of the Department of Obstetrics and Gynecology of the New Haven Hospital, wrote me concerning a case that had come under her care. The letter is as follows:

"I am sending you the picture of a baby born on our ward 2 months ago. This shows several interest-

[1] Diseases of the Umbilicus, p. 461.

ing conditions, among which are chondrodystrophy, internal hydrocephalus, congenital cystic œdema and a condition at the umbilicus about which I want to ask your opinion. The skin has not come together in the usual manner and does not extend up the cord, the intestines are plainly visible through the cord with apparently nothing but peritoneum and amnion over them. It conforms very well, it seems to me, to the condition described in your book on the umbilicus as an amniotic umbilicus. There is no real hernia, as the intestines do not protrude through the defect in the abdominal wall. Will you be kind enough to tell me if this is a true amniotic umbilicus?"

Dr. Tyler's surmise was correct.

UMBILICAL HERNIA AT BIRTH

It is probable that umbilical herniæ at birth are due to one of three causes or to a combination of these.

1. Stretching of an amniotic umbilicus; (2) the escape of abdominal contents through a patent umbilicus; (3) the failure of the intestines to recede into the abdomen.

As we all know, in the early months of fœtal life, the intestines extend into the cord.

Dr. George L. Streeter was good enough to send me the picture from which Figure 18 has been made. Here we can readily see intestinal loops shining through the wall of the umbilical cord.

Prompt operative interference is the only treatment to be thought of. Delay of a few hours may be fatal.

On January 8, 1920, I received a letter from Dr. William I. Stanton, of Washington, telling me of a most instructive case that had come under his care. His report is as follows:

"I am taking the liberty of writing you in regard to a case of hernia into the umbilical cord. It is the first one I have seen.

"I delivered a girl baby at term in a private home on December 22, at 2.15 in the morning. There was a large mass in the abdominal end of the cord, about the size of my fist. On holding up the cord and placing the lamp distal to the mass I could see the intestines through the amniotic covering of the cord. The blood vessels in the cord entered the abdomen to the right of and below the hernia. There was a small cyst of the cord at the junction of the hernial mass. The cord was ligated distal to the mass.

"Immediate operation was advised, but the parents would not consent. The cord and hernial mass were dressed with sterile gauze and the child put to bed.

Fig. 18. Hernia into the umbilical cord.
This photograph was kindly sent me by Dr. George L. Streeter, director of the Carnegie Research Laboratory in Embryology at the Johns Hopkins Medical School. No. 1585. Length of head and trunk 19 centimeters. The cord at the umbilicus is greatly enlarged and cystic, and shining through its thin walls are the dark outlines of intestinal loops. As one passes outward, the cord assumes its normal size and appearance. This is a typical example of a hernia into the umbilical cord.

"I visited the patient next morning and, on examining the hernia, noted that the intestines had changed in color to a dusky red. The parents were informed that unless the child was operated on the baby would perish, and that if not allowed to operate I would discontinue the case.

"I finally obtained permission to operate and took the infant to the Georgetown University Hospital. Dr. Thomas F. Lowe was called to give

Fig. 19. Sloughing hernia of the umbilical cord.
C. H. I. No. 18359. Baby P. This was the picture noted on the ninth day when the child came to my office. At the umbilicus was a large, foul mass. After removal of the secretion, the surface of the growth was found covered by a very thin, parchment-like membrane, which was in some places dry and crackly, and at other points represented by a purulent membrane. Coming off from the side of the mass was a mummified cord. The abdominal skin was carried up on the surface of the tumor for a considerable distance forming a definite collar. For the appearance of the contents of the sac see Figure 20.

ether and we operated at two in the afternoon just 12 hours after the time of birth.

"On opening the amnion and peritoneum we found the hernia to consist of the colon, cæcum, appendix, and small intestine, in all about two feet. The intestines were adherent to the wall of the sac over one-half its area. The umbilical ring admitted the tip of the index finger. The adhesions were freed. An incision was made through the umbilical ring and continued for about 2 inches. The bowels were returned to the abdominal cavity and the incision and umbilical ring closed with three silkworm-gut mattress sutures, the sac and skin edges having been cut away from the umbilical ring previous to this. The bowels showed signs of beginning strangulation. The appendix was not removed as I did not wish to prolong the operation unnecessarily. The infant was returned to its mother the same night and a regular four-hour feeding begun. The patient made an uneventful recovery and the sutures were removed on the twelfth day."

The following case exemplifies the tragedy that is almost sure to occur where the hernia of the cord remains for several days. Even in a few hours the outer covering may become dry and crinkly, and the intestines show much cyanosis.

I did not see this child until the ninth day. At this time there was a peritonitis.

Sloughing and Necrotic Hernia of the Umbilical Cord

C. H. I. No. 18359. Baby P., age 9 days, was admitted to the Church Home and Infirmary January 14, 1918. As soon as the baby was born a tumor was noted at the navel. The midwife, Anna Parr, said that the cord came off from the edge of the right side. The umbilical mass was 4 centimeters across, circular, and projected about 3.5 centimeters from the surface of the abdomen (Fig. 19). The skin was carried up on the surface of the tumor for at least 1 centimeter and then ended as a pinkish ridge. When I saw the child, it was impossible to detect any intestinal coils through the membrane covering the tumor. The surface of the tumor was covered with pus and it had a very fetid odor.

Operation. After carefully cleansing the tumor as far as possible, we opened the abdomen at the base of the mass, and continued the incision around the base of the mass until it was completely freed from the abdominal wall. The sac was then slit up and the intestinal contents were exposed (Fig. 20). The amniotic membrane was gradually peeled away from the surface of the intestine, but when we had done this, the intestines were found to be covered with a greenish yellow, fetid discharge. As there was blockage of the bowel, nothing remained for us to do but a resection. We removed about 8 inches of the small bowel, the cæcum, and some of the ascending colon, closed both ends, and did a lateral anastomosis. It was suggested that we might leave one end of the bowel open, and we thought of doing this, but when one remembers the way children cry and the absolute lack of control that one has over them, I thought it was wiser to close the ends of the bowel. We left a small drain in the lower angle of the incision. The child stood the operation well but was very cyanotic before it woke up.

January 15. The child has taken some water with a little sugar and also has taken the breast. As a result of enemata fæcal matter has been discharged by bowel.

After several days there was a leakage and some fæcal matter escaped from the umbilicus. At times nearly all the fæcal matter came away in this manner; at other times there were well-formed stools. Finally all the fæcal matter passed through the bowel and the fistulous tract closed up completely.

January 31, 1918. About 3 days ago the child started vomiting and Dr. Charles L. Summers saw it with me. The infant was apparently doing well until this morning at 6:30 when he suddenly died

Autopsy showed that the peritonitis which we had found at the time of operation had persisted and that there were purulent accumulations between intestinal loops and down in both the right and left flanks, as well as in the pelvis. It is almost unbelievable that a child with such widespread peritonitis could have survived 18 days after such an operation.

Had the child been brought to the hospital within the first 24 hours and before any peritoneal infection had occurred, the operation would, of course, have been a very simple one and the prognosis would have been good.

One of the most brilliant results in such a case was in the one operated on by Dr. Edward N. Reed of Clifton, Arizona. This case was recorded in the *Journal of the American Medical Association* and is reported in full in *Diseases of the Umbilicus*, p. 460.

A SATISFACTORY METHOD OF DEALING WITH INTESTINAL LOOPS DENSELY ADHERENT TO THE WALLS OF AN UMBILICAL HERNIA

In 1918 I saw a patient, 78 years old, who had a partial intestinal obstruction due to a very large umbilical hernia. At operation I found many loops of bowel so adherent to the sac that their liberation was impossible. The patient was not in good condition and we were in a serious dilemma.

Finally, I dissected the skin away from the sac and then with the aid of transmitted light separated the loops from one another, leaving pieces of sac attached to the loops of intestine. When all of the bowel had been unraveled, we had at least thirty to forty ragged pieces of sac attached to the bowel. These "patches" were trimmed off precisely as would be the repair patches on the inner tube of a bicycle tire. The surfaces of the patches were relatively smooth; they did not bleed. The intestines were returned to the abdomen and the hernial opening closed. The patient, a physician, is still in active practice, although 82 years old.

This method will undoubtedly be of value in a certain group of umbilical herniæ.

The case has been reported in detail in the *Journal of the American Medical Association*.

PERSISTENCE OF THE URACHUS[1]

Very little relating to the urachus has come to my attention during the last 6 years.

[1] Diseases of the Umbilicus, p. 481.

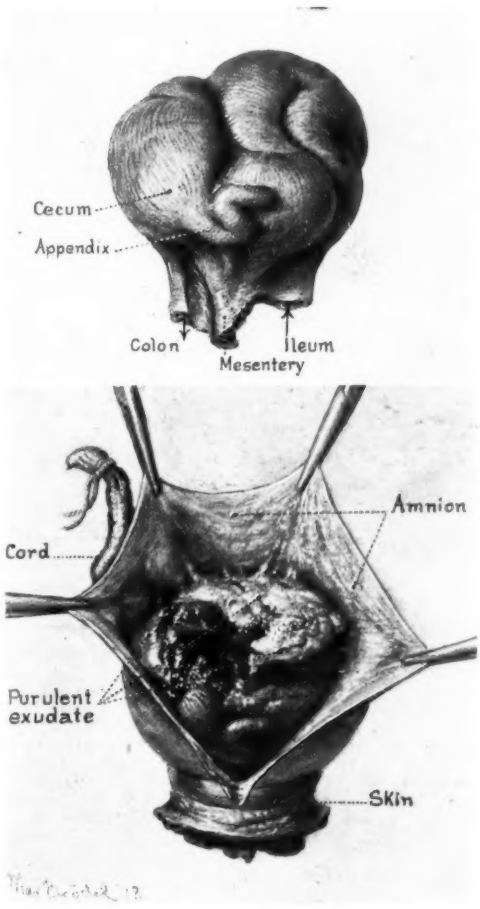

Fig. 20. Hernia of the umbilical cord accompanied by general peritonitis and partial intestinal obstruction. Removal of the cæcum and 8 inches of the small bowel that were incarcerated and obstructed in the sac; death on the eighteenth day after operation from a continuation of the general peritonitis.

C. H. I. No. 18359. Baby P. The lower picture shows the hernial sac and its contents after removal. At operation the abdomen was opened at the base of the hernia and the incision continued all the way around the base. When the sac had been completely severed from the abdomen it was possible to lift it well away from the abdominal wall and to wall it off satisfactorily. The sac was now slit open and its contents found so matted together by purulent material and so constricted that there remained but two plans of procedure; resection of the bowel leaving one or both ends open, or resection with lateral anastomosis. We chose the latter procedure on account of the extreme delicacy of the structures in a child only 9 days old. The upper picture gives an idea of the contents of the sac—the cæcum with the appendix and about 8 inches of small bowel.

Fig. 21. Persistence of the lower end of the urachus. C. H. I. No. 17084. Mrs. M. K. June 11, 1917. The umbilicus is usually prominent. In the mid-line below is the urachus which has been ligated. At the point of ligation it was 4 millimeters in diameter; as it passed away from the bladder, it became gradually smaller, and half way to the umbilicus disappeared. At the bladder the urachal stump was treated just as when dealing with an appendix.

I have seen one case with persistence of the vesical end of the urachus, and recently Dr. John E. Cannaday of Charleston, West Virginia, gave me the report of a case in which there was marked dilatation of the urachus associated with an imperforate urethra and absence of the rectum.

On January 25, 1922, when opening an abdomen in a case of pelvic inflammation, I encountered a urachal cyst measuring about 8 by 7 millimeters. This contained clear fluid and had very thin walls. It was directly continuous above and below with the urachal cord which did not average over 1 millimeter in diameter.

Persistence of the Vesical End of the Urachus

C. H. I. No. 17084. Mrs. M. K., age 31, entered the Church Home and Infirmary June 11, 1917. She was referred to me by Dr. H. P. Fahrney, of Frederick, and gave a history of having had a slight umbilical discharge at times. She also gave a definite history of chronic appendicitis and complained of a vaginal discharge.

Operation. We opened the abdomen in the mid-line, making an elliptical incision which included the umbilicus. This incision was continued downward, much care, however, being exercised to avoid the urachus. The urachus was examined and found to vary from 1 to 4 millimeters in diameter (Fig. 21). The dilatation was a gradual one increasing as one approached the bladder. We clamped the urachus near the bladder, tied it with catgut, and then took a purse-string of linen thread, turning in the stump just as one would do in dealing with an appendix. The area was then reinforced with catgut. The appendix was everywhere covered with adhesions. It was removed.

The patient made an uneventful recovery.

Absence of the Rectum, Imperforate Anus, Imperforate Urethra, Marked Dilatation of the Urachus

At the meeting of the Southern Surgical Association at Pinehurst, North Carolina, December 14, 1921, Dr. John E. Cannaday of Charleston, West Virginia, gave me a written report of the following case.

"On July 20, 1921, an infant, 36 hours old, was referred to me by Dr. Atlee Mairs of Charleston, W. Va.

"Examination shows a poorly developed infant, male, abdomen large and protuberant, distended in bladder region, flat to percussion over bladder area, anus absent, no dimpling, abdominal distention more noticeable on left side.

"The child has not voided urine. Am unable to introduce catheter into bladder, firm obstruction met with in perineal region. Diagnosis: imperforate anus, imperforate urethra.

"Operation. Novocaine anæsthesia. Right rectus incision in left lower abdomen. Exploration shows entire absence of rectum, a fibrous cord being in the location of the sigmoid. Ascending colon greatly distended.

"Urinary bladder greatly distended. Urachus distended all the way from the umbilicus to the bladder; diameter of urachus about 3 centimeters.

"The lower portion of the sigmoid was brought up into the wound, incised, and a rubber catheter fixed in the lumen by catgut sutures. The sigmoid was attached to the parietal peritoneum at that point.

"It was thought best to attempt to relieve the urinary obstruction by way of the umbilicus. A small probe was gently insinuated into the folds of that structure and a flow of urine immediately appeared at that point. A small rubber catheter was

inserted at the umbilicus and about 4½ ounces of normal urine were recovered. The orifice was greatly dilated and the tense fullness of the urachus and bladder had by this time disappeared.

The patient was removed from the hospital the next day by its parents. The living conditions at their home were unfavorable and the baby succumbed at the end of 10 days from inanition. No autopsy was obtained."

COMMENT

In the foregoing pages I have given a short account of the umbilical and urachal conditions that have come under my observation during the last 6 years. Our knowledge concerning lesions of this region is steadily increasing. If pathologists, physicians and surgeons will systematically record abnormalities of the umbilicus coming under their care, only a few more years need elapse before our knowledge of diseases of the navel will be fairly complete.

I cannot let the opportunity pass without thanking those who have written me and also sent me specimens, slides and pictures of their cases. I am under many obligations to Dr. John Howland. Any interesting umbilical case coming to his clinic at the Harriet Lane Hospital has been brought to my attention, not only for observation but also for treatment.

Dr. Max Zinninger has been good enough to locate quite a number of the cases for me. My heartiest thanks are due to my friend Max Broedel, director of the department of art in medicine, for his excellent drawings, and I am indebted to Mr. Hermann Schapiro for the photomicrographs, which are unusually good considering the thick sections I furnished him. Dr. Benjamin O. McCleary and Mr. Joseph Hoffman have helped me continually in the preparation of the article.

COMBINED TRANSPLEURAL AND TRANSPERITONEAL RESECTION OF THE THORACIC ŒSOPHAGUS AND THE CARDIA FOR CARCINOMA

By CARL A. HEDBLOM, M.D., F.A.C.S., Rochester, Minnesota
Section on Surgery, Mayo Clinic

MAY 15, 1922, I resected the thoracic œsophagus and the cardia for carcinoma involving both structures. The operation followed a preliminary resection of the fifth to the eleventh ribs and was performed under local anæsthesia, and gas and oxygen analgesia. The left pleural cavity and the peritoneal cavity were opened widely, the diaphragm was split down to the hiatus, the œsophageal stump was sutured to the skin edges in the middle axillary line, and the gastric stump was brought to the surface near the line. The patient recovered from the operation and is able to take food by mouth through a tube connecting the stomata.

REPORT OF CASE

Case A387727. Mr. J. P. P., age 52, came to the Clinic, March 13, 1922, because of hiccough and difficulty in swallowing for 2½ months. At first his difficulty was in swallowing solid foods, but at the time of admission to the Clinic he was obliged to eat very slowly in order to swallow semi-solids or liquids. He had lost about 15 pounds in weight.

The patient had good color, seemed fairly well nourished, and weighed 129 pounds. The systolic blood pressure was 140, the diastolic 80. The hæmoglobin was 75 per cent and the leucocyte count normal. The Wassermann reaction on the blood, examination of the urine, and roentgenogram of the chest were negative. A bismuth roentgenogram of the œsophagus showed an obstruction at its lower portion. An œsophageal bougie met obstruction about 43 centimeters from the incisors. The obstruction was dilated to 35 F. and a bougie of 45 F. was passed part of the way through. A diagnosis was made of carcinoma of the œsophagus. The patient, after being advised of the seriousness of the situation, favored operation which would offer him a chance for cure.

Preliminary thoracoplasties were performed April 7, April 11, and April 24, under local anæsthesia, and nitrous oxid and oxygen analgesia, at which the fifth to the eleventh ribs inclusive were resected from the angle to the costal cartilage. Resection of the tumor was performed May 15, under local and nitrous oxid and oxygen anæsthesia. An incision was made, beginning to the left of the middle line, a little below the level of the costal margin, and extending outward and upward to the anterior axillary line. The peritoneal cavity was opened and explored. The growth was found to be localized in the cardia, but extended through the hiatus. The thin left margin of the liver adjacent to the cardia was adherent to it. There were no markedly enlarged glands. The incision was then extended upward to about the level of the fourth rib in the middle axillary line, and the pleural cavity was opened. Following the evacuation of several hundred cubic centimeters of serosanguineous fluid the lung was found partially collapsed. There was no embarrassment of respiration following the wide opening of the pleural cavity. A radical operation having been decided on, the diaphragm was split down to the hiatus and the pleura incised over the lower œsophagus. Palpation now revealed involvement of the lower thoracic œsophagus. The right vagus trunk was separated at the hiatus and the left trunk was cut. There was no appreciable change in the patient's pulse or respiration during this procedure. The lower portion of the œsophagus and the cardia were mobilized and about 4 centimeters of the thoracic œsophagus, most of the stomach at the lesser curvature, and the upper third of the greater curvature were resected between clamps with the actual cautery. A segment of the adherent liver edge was also excised. The stomach was closed with two rows of chromic catgut and one row of silk. The upper end of the resulting tube-like residue of the stomach was brought through the median angle of the wound and sutured in place, projecting slightly above the level of the skin. The diaphragm was sutured with continuous chromic catgut. The œsophageal stump was sutured to the depressed skin edges with two rows of silk, the first being placed through the subcutaneous tissue; the second included the skin edge and the outer coats of the œsophagus. The crushing clamp on the œsophagus was left in place. A rubber tube was placed in a small residual cavity below the stoma. The wound was closed with chromic catgut and silkworm gut.

Immediately at the completion of the operation, which lasted about 2 hours, the patient was fully conscious and rational; his pulse was 130, and of fair quality. The blood pressure just preceding operation was 120 systolic, and 96 diastolic; the pulse was about 90. During the first hour of operation the blood pressure remained elevated to between 130 and 144 systolic, and 90 and 118 diastolic. For a brief period during the dissection of the growth at the hiatus, the blood pressure fell to 122 systolic and 100 diastolic. It fluctuated between 130 and

Fig. 1. (A387727.) Roentgenogram of the œsophagus filled with bismuth, showing the stricture at the cardia.

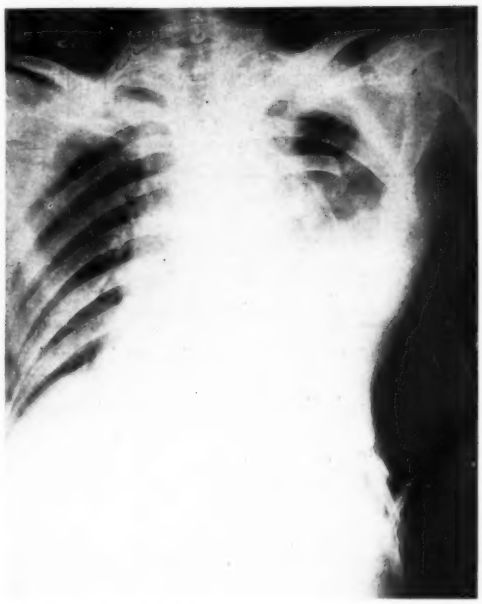

Fig. 2. (A387727.) Roentgenogram showing resection of the fifth to the eleventh ribs, inclusive, with collapse of the lower portion of the left thorax.

144 systolic during the last hour of operation, falling to 110 systolic and 102 diastolic just as operation was completed. The patient was transfused with 500 cubic centimeters of blood, not so much because of loss of blood, as because of the severity of the operation. His blood pressure one-half hour after operation was 126 systolic and 100 diastolic. The morning after operation his pulse was 135 and the quality was fair. His temperature was 100.5°. Fluid was administered by proctoclysis, about 2 liters being absorbed by rectum the first 24 hours. The pulse remained about 120 for 48 hours and then dropped to between 90 and 100 where it remained for the next week. The temperature rose to 101.2° the day following operation, and then gradually subsided to normal on the sixth day with slight fluctuations between 98 and 99 until the tenth day.

Doctor A. C. Broders reported on the specimen as follows: "The excised specimen consists of a cardiac portion of the stomach and about 4 centimeters of the lower end of the œsophagus. An annular carcinoma of the stomach has infiltrated beneath the mucosa, producing a mass measuring in the fixed specimen 9 by 7 by 2 centimeters. In areas the growth extends through the serosa. There is practically no ulceration. The whole picture is not unlike the leather-bottle type of carcinoma in that it shows little tendency to produce ulceration of the mucosa. The growth involves the lower portion of the œsophagus. A number of lymph nodes show metastasis. There is a margin of normal tissue several centimeters wide above and below the growth."

Three days after operation the crushing clamp was removed from the stump of the œsophagus and about 10 cubic centimeters of thick yellowish, sour-smelling material was evacuated. The stump, except for the sloughing margin, was pink and appeared viable. By the tenth day the slough had separated and the œsophagus was firmly adherent to the edges of the skin. Except for a few stitch abscesses, the wound in the skin healed promptly. A small pocket below the œsophagus was kept clean by irrigation.

On the fifth day, the tubular end of the stomach protruding through the wound was opened. A catheter was inserted, presumably into the duodenum, and milk, cream, and lactose were given through it. Later, eggs, beef juice, thick soups, and fruit juices were added to the diet. The caloric intake was increased after a few days to from 2,500 to 3,500 calories daily. On the fourteenth day, a 5 millimeter tube was inserted into the two stomata, and when the patient swallowed a glass of milk, there was very little leakage around the tube. On the twentieth day, he swallowed liquids containing 1,800 calories of food. He swallowed without apparent effort but slowly.

During the second week there was a tendency to diarrhœa but this subsided. On the twenty-third day, the stool was formed and has remained so. On the tenth day, the patient sat up in a chair. He was very weak, however, and as his hæmoglobin was found to be only 42 per cent, he was transfused on

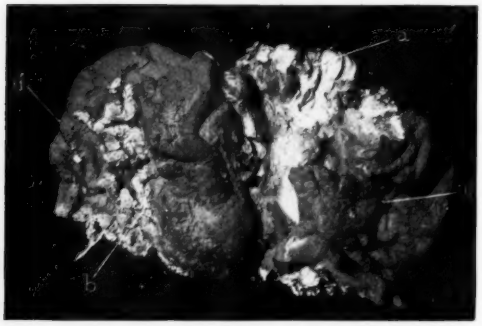

Fig. 3. (A387727.) Photograph of the excised specimen, the stomach and œsophagus having been split in a longitudinal direction. *a*, Lower thoracic œsophagus; *b* and *c*, the borders of the tumor; *d*, the normal gastric mucosa.

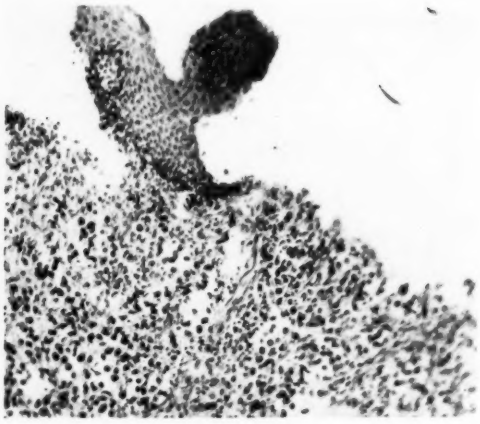

Fig. 4. (A387727.) Photomicrograph showing the rapidly growing, highly malignant carcinoma in close relationship to the squamous epithelium of the œsophagus.

the twelfth day. He then improved markedly and began to walk by the end of the third week. Six weeks after operation, he was gaining steadily in weight and strength and his general health was in all respects quite satisfactory.

July 21, the patient has gained several pounds in weight. His hæmoglobin has increased from 35 to 65 per cent and he is now taking all his nourishment including soft solids such as boiled egg, cereal, milk toast, and so forth, by mouth.

DISCUSSION

This is the second reported case in which operation was performed by this method. The first case was one reported by Zaaijer, in 1913. His procedure differed only in that he performed a preliminary Kader gastrostomy and a single stage rib resection, but the patient developed alarming respiratory embarrassment following this extensive single stage rib resection. He was able to take liquid food by mouth and was in a satisfactory condition at the time of the report, about 1 month after the resection.

The first attempt to resect the thoracic œsophagus and the cardia for carcinoma, involving both structures and necessitating a transpleural exposure, was made by Mikulicz, in 1896. To avoid pneumothorax he obliterated the lower anterior portion of the pleural cavity by approximating the diaphragmatic pleura to the parietal by means of sutures through the diaphragm and chest wall. The patient died of peritonitis. After Sauerbruch had perfected his differential pressure chamber, he operated on a relatively large number of patients by the transpleura route, anastomosing the stump of the stomach lifted into the pleural cavity to the resected thoracic œsophagus, but fatal leakage at the site of anastomosis invariably followed. Only one case promised a successful outcome, but the patient died from pneumonia on the fourteenth day. Many cases have been reported by others, but all resulted unfavorably. Despairing of success by such methods, Ach and others dislodged the resected œsophagus by a stripping or dissection operation, displacing it to an antethoracic position through an incision in the neck. None of the patients operated on in this manner, in which the cardia was also resected, recovered from the operation.

In the consideration of operative methods and case reports a clear distinction must be made betwen cases of carcinoma involving the hiatus and thoracic œsophagus, and cases in which these structures are normal. In the case herein reported it would have been impossible to effect an anastomosis between the œsophagus and gastric stumps below the diaphragm, even had it been possible to separate the growth infiltrating the hiatus. After the tumor, with 1 centimeter of normal œsophagus, had been resected, it was with great difficulty, working within the pleural cavity, that I loosened the œsophagus suffi-

ciently to reach the depressed skin margins and it lacked several centimeters of reaching the level of the hiatus of the diaphragm.

The first successful complete gastrectomy was performed by Schlaetter in 1897. There is some uncertainty as to whether many of the cases reported later were complete gastrectomies. Forty-six cases are reviewed in the literature. In 1917, W. J. Mayo performed a total gastrectomy including about 16 millimeters of the œsophagus. The patient is in fair health 5 years after operation.

Resection of the cardia for carcinoma, mobilizing the normal œsophagus at the hiatus, and pulling down the thoracic portion sufficiently to effect an anastomosis to the stump of the stomach or loop of the jejunum below the diaphragm without leakage has proved very difficult. The operation was first successfully performed, in 1908, by Voelcker, who pulled the œsophagus down and anastomosed it to the resected stomach. The site of anastomosis leaked for 4 weeks and then healed completely. The second case with a favorable outcome was reported by Kuemmel in 1910. Failing in an attempt to anastomose the stumps he fastened rubber tubes into the openings in the duodenum and stomach bringing the other ends of the tubes through the abdominal incision and packing around them. Healing brought about a partial anastomosis which he proposed to complete later by operative measures. Bircher, in 1918, in a third case in which the patient survived, effected an anastomosis which did not leak. There was marked ptosis of the stomach, however, and presumably the abdominal portion of the œsophagus was also elongated.

Complete gastrectomy seems to have been more successful than resection of the cardia, probably for the reason that in most of these cases practically all of the abdominal œsophagus has been left for the anastomosis.

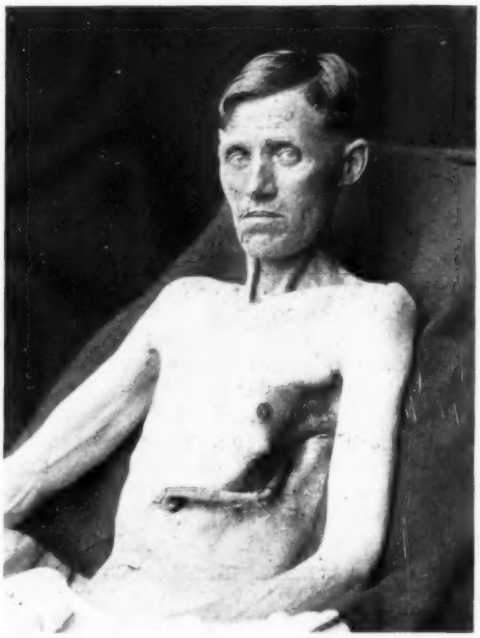

Fig. 5. (A387727.) Photograph of the patient taken 1 month after operation.

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INFECTION IN THE MEDIASTINUM IN FULMINATING CASES OF EMPYEMA[1]

By EDWARD K. DUNHAM, M.D., New York
Formerly Major, Medical Corps, U. S. Army[2]

COMPARATIVELY recent experimental studies on monkeys have shown that the infections of the lung causing pneumonia reach the alveoli, at least in many cases, by way of the interstitial tissue (1). The organisms gain access to the subepithelial areolar tissue of a bronchus and are conveyed thence to the parenchyma of the lung, causing vascular damage leading to the exudate which, together with the organisms, breaks into the alveoli. It is through this interstitial framework of the lung that the infecting organisms are carried to the subpleural structures, causing pleuritis and eventually empyema. The studies of MacCallum (2), Opie and others (3) have demonstrated this course of events in many cases of empyema occurring in the Army, particularly when the offending organism has been a streptococcus. An acute interstitial bronchopneumonia sometimes led so rapidly to an empyema that a massive pleural exudate masked the physical signs of any pneumonic consolidation which might be present and appeared to be the primary condition. Fulminating cases of empyema of this nature were frequently associated with pericarditis or peritonitis, or all three localizations occurred so nearly simultaneously that the impression was created that the streptococcus had a particular affinity for serous membranes and that this affinity explained the occurrence of the "polyserositis."

The statistical data furnished by approximately 4,000 cases collected in the form of special empyema records of non-traumatic empyema in the Army within the United States, led to the belief that these cases of polyserositis were in reality not the result of any special predilection of the streptococcus for serous membranes, but might be a very simple and inevitable consequence of the anatomical relations of the parts concerned and the abundant exudation of serum which follows infection of any soft tissues with streptococci. In other words: Given, the character of damage occasioned by the streptococcus with a primary localization in the interstitial tissue of the lung, an extension of the infection to the pericardium and peritoneum might well appear an inevitable consequence.

One of the striking phenomena of a fulminating infection of soft parts with the streptococcus is the failure of the inflammatory reaction induced in the tissues to confine the infection. It spreads rapidly along lymphatic channels but is not confined to these; for a phlegmon, due to the presence of the organisms in the areolar tissue, is not uncommon. If this process is inaugurated in the interstitial tissue of the lung, an extension to the pleura is a natural consequence. But is there any valid reason why a similar extension toward the hilum should not also take place? Such an extension would infect the mediastinal structures and bring the organisms into a relation to the parietal pericardium similar to that which in the case of the visceral pleura gives rise to empyema. Furthermore, if the organisms are present in the spaces of the mediastinal areolar tissue they may be conveyed to the subperitoneal structures; for the external coat of the œsophagus and the adventitia of the aorta and other blood-vessels passing through the diaphragm are but a part of this areolar tissue. There is a further consequence of this assumed extension: An infection of parts so freely open to lymphatic drainage would almost inevitably lead to entrance of the organisms into the blood stream.

The sequence of events here pictured would doubtless long since have become familiar to clinicians had the process been

[2]The writer gratefully acknowledges the essential aid he has received from Colonel George R. Callender, and his associates at the Army Medical Museum in the selection of material used for illustration, and from Dr. Franklin A. Stevens in the histological examination of this material.

[1] Read before the Surgical Section, New York Academy of Medicine, February 3, 1922.

TABLE I.—EMPYEMA, 536 CASES WITH AUTOPSY; DEATHS GROUPED IN PERIODS OF ONE WEEK

Period of death, weeks	Total cases	Bilateral pneumonia	Percentages	Bilateral empyema	Percentages	Pericarditis	Percentages	Peritonitis	Percentages	Mediastinal infection	Percentages	Cervical infection	Percentages
0–1	332	288	86.7	147	44.3	113	34.0	47	14.2	42	12.7	8	2.3
1–2	94	71	75.5	38	40.4	33	35.1	21	22.3	12	12.8	1	1.1
2–3	70	52	74.3	33	47.1	27	38.6	15	21.4	9	12.9	0	0
3–4	35	21	60.0	23	65.7	18	51.4	7	20.0	4	11.4	0	0
	531	432	81.4	241	45.4	191	36.0	90	16.9	67	12.6	9	1.7
4–5	5	5	100%	4	80.0	1	20.0	2	40.0	0	0	0	0
	536	437	81.5	245	45.7	192	35.8	92	17.1	67	12.5	9	1.7

a leisurely one, or one less rapidly fatal. There is no definite record showing the recognition of acute mediastinal infection during life among the histories of 3,889 cases of empyema, yet this condition was noted at autopsy in 67 of the 531 necropsies on cases that died within 4 weeks after empyema was recognized. This amounts to 12.6 per cent. There was, however, one case which may have been a mediastinal abscess, which was recognized during life and successfully treated by trephining the sternum. This may, however, have been a pleural pocket extending across the median line, there being no way of reviewing this case to determine whether the pus was within or outside the pleura. Of these 67 autopsied cases with mediastinitis, 42 died within 1 week after the date on which the existence of an empyema was first recorded.

Forty-six of the cases were definitely associated with streptococcus in the pleural exudate, 11 with pneumococci, of which the type was determined in 10, with the following results: Type I, 1; Type III, 1; Type IV, 8. Fifty-seven, or a trifle over 85 per cent, had bilateral pneumonia; 44 (nearly 66 per cent) had bilateral empyema; 35 (52 per cent) pericarditis, and 8 (nearly 12 per cent) peritonitis. Of all the fatal cases of peritonitis, nearly 8 per cent presented a mediastinal infection sufficiently striking to be noted at autopsy and this is also true in 11.5 per cent of the cases in which a pericarditis was mentioned in the protocol. The fulminating character of the cases is shown by the fact that in 26 (nearly 39 per cent) no operation was attempted.

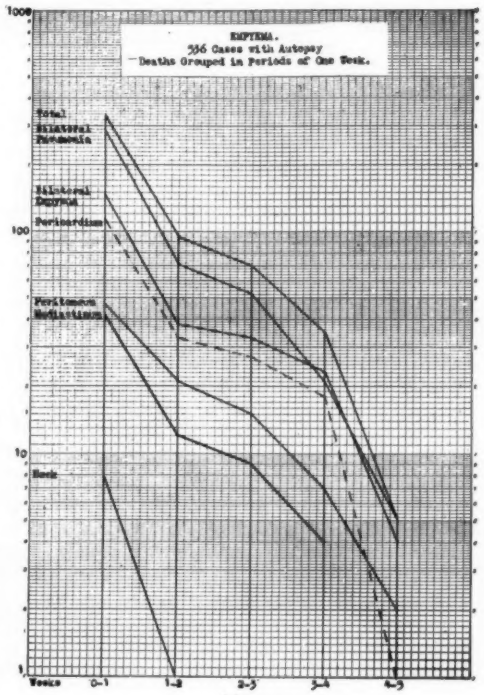

Fig. 1.

There is no evidence that the pathologists assigned to Army hospitals laid particular stress upon these mediastinal infections or their association with pericarditis. It is obvious that a mediastinal infection might be secondary to a pericarditis, and this was the explanation of its occurrence which appears to have been generally accepted when attention was directed to an association between the two conditions. But there was a case at Camp Logan in which the postmortem findings were interpreted as indicating that the pericarditis was secondary to a mediastinal infection, as is shown by the following note made by Major J. M. Willis: "In this case a diagnosis of empyema of the anterior mediastinum was made and obstruction from compression of the trachea demonstrated more than a week before death. The suddenness of the development of the right empyema and the purulent pericarditis, with the finding of a definite tract from the mediastinal abscess to the pericardium, led

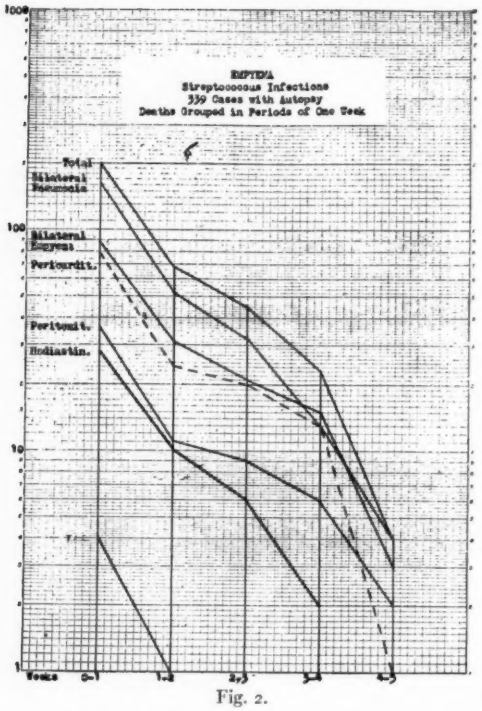

Fig. 2.

us to believe that the mediastinal trouble was the source of origin of the other suppurations." The clinical history of this case has not been traced, but an extract from the autopsy protocol states that the pericardium was greatly distended and contained about a quart of pus and fibrinopurulent exudate without adhesions. Beneath the heart there was a tract that led back to the region of the bifurcation of the trachea, but did not communicate with the pleural cavities. The heart was slightly enlarged and flaccid, the valves normal. At the bifurcation of the trachea there was a mass of glands about the size of two fists from which when cut there exuded a cheesy material.[1]

Bacteriological examinations of the mediastinal fluids were rarely made at autopsy. There is a report from Camp Bowie of eight such examinations made upon cases in which both mediastinal and subcutaneous emphysema were present. In three of these no

[1] Manuscript report to the Surgeon General.

TABLE II.—EMPYEMA, STREPTOCOCCUS INFECTIONS; 339 CASES WITH AUTOPSY; DEATHS GROUPED IN PERIODS OF ONE WEEK

Period of death, weeks	Total cases	Bilateral pneumonia	Percentages	Bilateral empyema	Percentages	Pericarditis	Percentages	Peritonitis	Percentages	Mediastinal infection	Percentages	Cervical infection	Percentages
0–1	199	161	80.9	88	44.2	79	38.7	36	18.1	28	14.1	4	2.0
1–2	68	52	76.5	31	45.6	24	35.3	11	16.1	10	14.7	1	1.5
2–3	45	32	71.1	21	46.7	20	44.4	9	20.0	6	13.3	0	0
3–4	23	13	56.5	15	65.2	13	56.5	6	26.1	2	8.7	0	0
	335	258	77.0	155	46.3	136	40.6	62	18.5	46	13.7	5	1.5
4–5	4	4	100	3	75.0	1	25.0	2	50.0	0	0	0	0
	339	262	77.3	158	46.3	137	40.4	64	18 9	46	13.6	5	1.5

growth was obtained; in three the cultures yielded pneumococcus, Group IV, and the remaining two cases streptococci, one hæmolytic and the other not (4). It is worthy of remark that in all the instances in which there were positive findings the organism was either a streptococcus or pneumococcus, Group IV. In all these cases the corresponding organism was found in the blood postmortem.

It would be difficult, from autopsy findings alone, to determine definitely the actual sequence of events leading to the conditions found. But the statistical and experimental evidence at least suggest that a mediastinal infection may be an intermediate step between infection of the areolar tissue within the lung and a pericarditis originating in the parietal layer of the pericardium.

The statistical evidence is taken from special empyema records collected for the *Medical History of the Great War.* The data are summarized in the accompanying tables (Tables I and II and charts Figs. 1 and 2).

The tables give the total number of cases, and of these the number in which bilateral pneumonia, bilateral empyema, pericarditis, mediastinal infections and abscesses or phlegmon of the neck were observed and noted in the protocols. These figures are arranged in groups according to the week in which death occurred after the recognition of a pleural infection. The percentages which these figures bear to the total for the corresponding period are also given, so that it is possible to see at a glance the degree of constancy in the

TABLE III.—EMPYEMA, 67 CASES WITH MEDIASTINITIS

Bacteriology	Strept.	Pneum. Type I	Pneum. Type III	Pneum. Type IV	Pneum. Type ?	Staph.	?	Total
Death 0–1 Week after Empyema, 42 Cases								
A Bilateral pneumonia	26	1	1	6	1	1	4	40
B Bilateral empyema	23	1	1	6	1	1	3	36
C Pericarditis	16	0	1	5	1	1	1	25
D Peritonitis	3	0	0	0	0	0	1	4
E Cervical phlegmon	1	0	0	0	0	0	0	1
Associated								
A+B+C+D	2	0	0	0	0	0		2
A+B+C	13*	0	1	5	1	1	1	22
A+B+D	0	0	0	0	0	0	1	1
A+B+E	1	0	0	0	0	0	0	1
A+B	7	1	0	1	0	0	1	10
A+C	1†	0	0	0	0	0	0	1
Death 1–2 Weeks after Empyema, 12 cases								
A Bilateral pneumonia	8	0	0	0	0	0	1	9
B Bilateral empyema	3	0	0	0	0	0	0	3
C Pericarditis	3	0	0	1	0	0	0	4
D Peritonitis	1	0	0	1	0	0	0	2
E Cervical phlegmon	1	0	0	0	0	0	0	1
Associated								
A+B+C	1	0	0	0	0	0	0	1
A+B	2	0	0	0	0	0	0	2
A+C	1	0	0	0	0	0	0	1
A+E	1	0	0	0	0	0	0	1
B+D	1	0	0	0	0	0	0	1
C+D	0	0	0	1	0	0	0	1
Death 2–3 Weeks after Empyema, 9 Cases								
A Bilateral pneumonia	4*	0	0	0	0	1	2	7
B Bilateral empyema	1	0	0	0	0	1	1	3
C Pericarditis	2	0	0	0	0	1	2	5
D Peritonitis	1	0	0	0	0	0	0	1
Associated								
A+B+C	1	0	0	0	0	1	1	3
A+C+D	1	0	0	0	0	0	0	1
A+C	0	0	0	0	0	0	1	1
Death 3–4 Weeks after Empyema, 4 Cases								
A Bilateral pneumonia	2	0	0	0	0	0	0	2
B Bilateral empyema	2	0	0	0	0	0	0	2
C Pericarditis	1	0	0	1	0	0	0	2
Associated								
A+B+C	1	0	0	0	0	0	0	1
A+B	1	0	0	0	0	0	0	1

* Mediastinal emphysema, 1 case.
† Acute œsophagitis, 1 case.

ratios of the various conditions during the different periods of time.

The charts (Figs. 1 and 2) present these data in graphic form, plotted upon a logarithmic scale. The particular advantage of this scale is that parallel lines indicate identity in the ratios between the quantities represented by those lines.

Both the tables and charts make it evident that there is a remarkably close relationship between the six conditions which they include during the first 2 weeks. In Table I, the percentage of peritonitis is relatively low in the first week, but in Table II, which is confined to the cases with streptococcus empyema, the percentage of peritonitis

TABLE IV.—POST-INFLUENZAL AND POST-MEASLES EMPYEMA, 251 CASES WITH AUTOPSY

Death after empyema, weeks	Organism present in pleural fluid	Influenza: Total cases	Influenza: Mediastinitis	Influenza: Percentages	Measles: Total cases	Measles: Mediastinitis	Measles: Percentages
0–1	Streptococcus	60	14	23.3	36	5	13.9
	Pneumococcus	26	9*	34.6	2	0	0
	Staphylococcus	2	1	50.0	0	0	0
	Unknown	12	1	8.3	36	0	0
		100	25	25.0	74	5	6.8
1–2	Streptococcus	14	4	28.6	9	1	11.1
	Pneumococcus	4	1†	25.0	0	0	0
	Staphylococcus	0	0	0	0	0	0
	Unknown	2	0	0	6	0	0
		20	5	25.0	15	1	6.7
2–3	Streptococcus	10	1	10.0	6	0	0
	Pneumococcus	7	0	0	0	0	0
	Staphylococcus	0	0	0	0	0	0
	Unknown	2	1	50.0	3	0	0
		19	2	10.5	9	0	0
3–4	Streptococcus	5	0	0	4	0	0
	Pneumococcus	2	1†	50.0	0	0	0
	Staphylococcus	0	0	0	1	0	0
	Unknown	0	0	0	2	0	0
		7	1	14.3	7	0	0

* Type I 1, Type II 1, Type IV 6, unknown 1.
† Type IV.

is greater in the first week than in the second. It is not unlikely that the peritonitis occurring in cases of pneumococcal empyema owed its origin to a secondary infection with streptococci and that this occasioned some delay in the peritoneal infection.

In this connection it is of interest to examine the data concerning the infecting organisms in those cases in which a mediastinal infection was so striking that it attracted attention and was noted in the autopsy protocol. The available data are in most cases derived from reports on the bacteriological examination of the pleural exudates and may not always indicate the organism that induced the mediastinitis.

From Table III it is evident that the great majority of the cases of obtrusive mediastinal infection were associated with streptococci in the pleural fluid. Next in frequency is pneumococcus, Type IV, a somewhat indefinite group containing members which, in the pathology of empyema, produces effects indistinguishable from those occasioned by hæmolytic streptococci. Two cases are reported as associated with a staphylococcus in

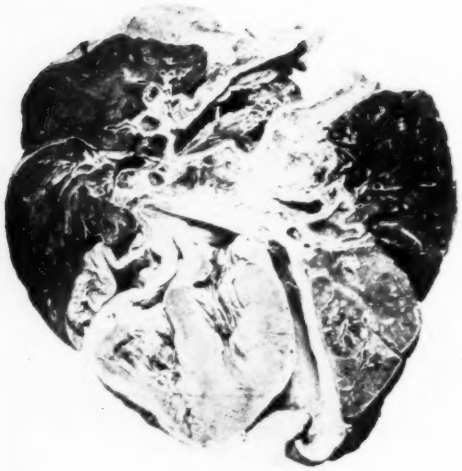

Fig. 3. Coronal section through thoracic organs. (Acc. 6152, Army Medical Museum.)

the pleura, and one each with pneumococcus Types I and III.

While statistics of this character are highly suggestive they are not wholly convincing, for they do not reveal the mechanism by which the infection is conveyed. The infecting organisms might be carried by the circulating blood or they might follow the spaces in the areolar tissue or be transported through lymphatic vessels.

If it were possible to demonstrate by microscopical examination the presence of bacteria in the mediastinal tissues in a case of empyema complicated with pericarditis in which it was known that the blood was sterile, the localization of these bacteria and the tissue changes in their immediate vicinity might throw light upon the actual occurrence of pericardial infection through this mode of transmission. A search through the material sent from the military Camps to the Army Medical Museum has resulted in securing a specimen suitable for such study.

The case was a private admitted to the Base Hospital at Camp Hancock on January 27, 1919, after having had a sore throat and cough for one day. On admission his tonsils were red and swollen. The diagnosis was: tonsillitis, acute follicular, bilateral; stomatitis, acute; pharyngitis, acute catarrhal. Neither diphtheria bacilli nor streptococci were found in cultures from the throat. The leucocytes in the blood were estimated at 8,800 per cubic millimeter, with 66 per cent of the polymorphonuclear form. The patient did well for 4 days. On February 4, 8 days after admission, a small area of consolidation of the lung on the left side was noted and diagnosticated as bronchopneumonia. The following day his condition was improved and was described as fairly good the day thereafter. But the next day, February 9, vomiting with dyspnœa set in, the pulse became weak and the percussed outline of the heart increased, but there were no friction sounds. He died that morning at 11 o'clock.

An autopsy was held the following day at 1:30 in the afternoon, 26½ hours after death. The following is transcribed from the protocol:

Left pleura. Full of cloudy, yellowish, thin fluid in which are many shreds of whitish coagulum. The lower posterior part of the lower lobe of the lung is adherent to the parietal pleura by recent agglutination so that fluid occupies the upper part of the pleural cavity, the accumulation lying both internal and external to the upper lobe of the lung. The visceral pleura is covered by a layer of fibrinous exudate 1 millimeter thick and the interlobar cleft is closed by rather firm adhesions.

Left lung. Compressed, but solid throughout, practically airless. The cut surface appears uniformly dark red and yields a moderate amount of bloody fluid. There are no evident plugs of fibrin in the alveoli. The bronchi are congested and contain a slight amount of mucus.

Right pleura. Free and contains an excess of clear fluid. There are numerous petechial spots over the posterior and lateral surface of the lower lobe of the lung.

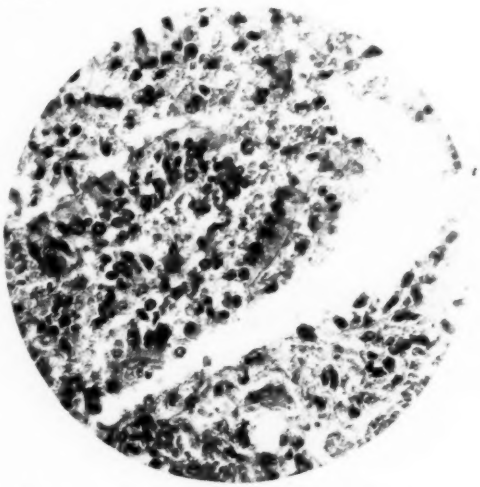

Fig. 4. Section through small bronchus in a case of acute interstitial pneumonia. (Acc. 3048, negative 30927 Army Medical Museum.)

Right lung. There is a wedge-shaped segment of consolidation in the lower lateral portion of the upper lobe. On section this is dark in color, firm, and in relation to one of the smaller bronchi. The rest of the lung is much engorged, especially the lower lobe, which is firmer than usual. The lung as a whole is œdematous, but air-containing.

Mediastinum. The fatty and areolar tissue are œdematous and infiltrated so as to appear firmer and more thickened than normal.

Pericardium. Both parietal and visceral layers are thickened and opaque, evidently from a recent exudate. There are a few cubic centimeters of cloudy fluid, but no excess.

Heart. Large, muscle pale, cloudy and friable with moderate hypertrophy of the left ventricle. The right side contains a tenacious yellow clot, but the endocardium and valves are smooth.

Anatomical diagnosis. Lobar pneumonia, left upper and lower lobes, acute, resolving. Bronchopneumonia, segmental, acute, right upper lobe. Pleuritis, purulent left, acute. Pericarditis, fibrinopurulent, subacute. Mediastinal cellulitis, acute.

Cultures. Hæmolytic streptococci from the pericardial fluid and the upper lobe of the right lung. Culture media inoculated with blood from the heart remain sterile.

The thoracic organs were removed at autopsy without separating them from each other, preserved in formaline and sent to the Museum, where they are recorded as Accession Number 6152. Figure 3 is reproduced from a photograph of a coronal section through the lungs, heart, and mediastinum. In the left lower lobe a patch of acute interstitial bronchopneumonia is clearly shown, with an infiltration of the interlobular septa extending to the pleura, where one or more tiny subpleural abscesses can be discerned. A heavy fibrinopurulent exudate agglutinates the two pleural surfaces in this region. The pericardial sac is lined with a much thinner layer of fibrin and when opened at autopsy contained a serofibrinous exudate. It was recognized at the autopsy that the mediastinum was also affected, but no cultures were made from the serous fluid present in these tissues. The photograph shows the peribronchial and mediastinal glands to be enlarged.

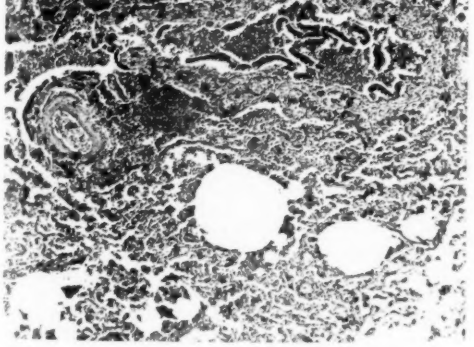

Fig. 5. Section of lung including a small bronchus. There is a purulent infiltration of the peribronchial areolar tissue. (Acc. 16366, negative 31968, Army Medical Museum.)

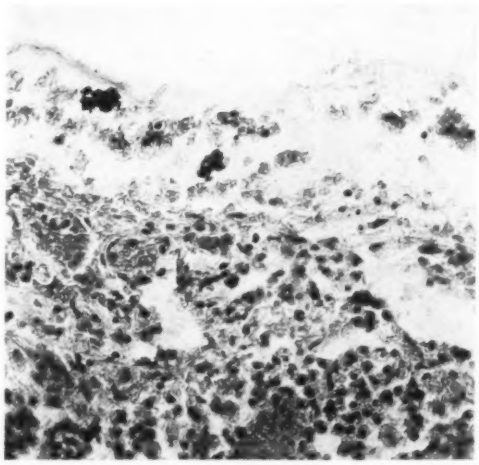

Fig. 6. Early stage of pleuritis. Streptococci in serous exudate beneath the endothelial layer. (Negative 32466, Army Medical Museum.)

From this gross specimen, sections were made for microscopical study from portions of the lower lobe of the left lung so as to include the two layers of the pleura with the intervening exudate, the adjacent pericardium and the thin layer of connective tissue lying between this and the parietal pleura. Other portions selected for microscopical examination were the tissues at the hilum and within the mediastinal space, some of the latter including the parietal pericardium.

It will assist in the interpretation of the microscopical pictures presented by these sections, if the pathological processes which lead to an interstitial pneumonia and subsequent empyema are briefly reviewed. For this purpose the following photographs made at the Army Medical Museum serve admirably (Figs. 4, 5, 6, and 7).

Figure 4 shows a portion of a section through the wall of a small bronchus. The lumen contains pus and cellular detritus. The lining epithelium is either becoming detached or has wholly disappeared and the underlying tissues are exposed to the septic contents of the bronchus.

Figure 5 depicts an oblique section of a small bronchus in which the epithelial lining has become separated and lies within the pus occupying the lumen. In the neighborhood of the accompanying artery, the suppuration has extended into the peribronchial interstitial tissue.

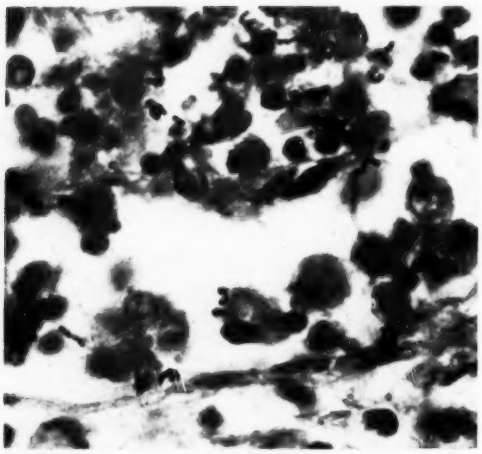

Fig. 7. Section of mediastinal lymph gland. (Acc. 3300, negative 33030, Army Medical Museum.)

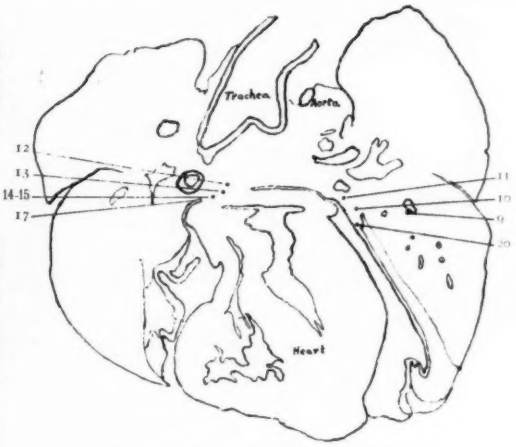

Fig. 8. Outline tracing of Figure 3, showing the regions from which specimens were taken for microscopical examination. Numbers indicate figures.

Figure 6 is taken from a section through the periphery of the lung at a stage in the extension of the interstitial infection when the organisms have reached the subendothelial tissues of the pleura. These are infiltrated with serum containing leucocytes and groups of streptococci. The endothelium has been raised and its disintegration is imminent. The next step in the process would be the infection of the pleural cavity, leading to empyema.

Figure 7 is a section of a mediastinal lymph gland invaded by streptococci.

Returning to the specimen from Camp Hancock, a careful microscopical search through these sections has revealed the presence of isolated diplococci in several situations within the mediastinum. In some places they lie between the fibers of connective tissue, where these are somewhat separated, evidently owing to an inflammatory œdema. In other places the diplococci lie in close relation to the fat cells of the mediastinal adipose tissue.

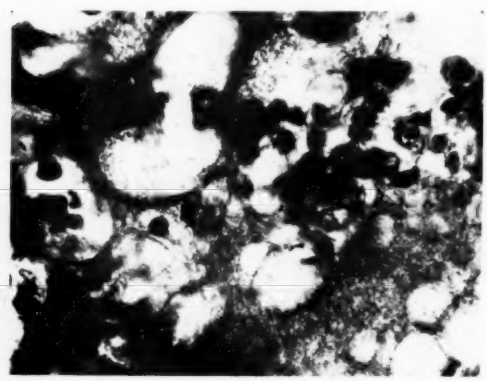

Fig. 9. A short streptococcal chain in close proximity to a fat cell in the peribronchial tissues near center of left lower lobe. Cellular infiltration and the presence of fibrin are evidence of acute inflammation. (Slide 6152–3–2, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

To give a clear idea of the regions from which the sections were made, an outline tracing of Figure 3 has been made, upon which the localities are indicated (Fig. 8), and photomicrographs of the fields in which the organisms were found are reproduced in Figures 9 to 15. These photographs do not depict quite all of the organisms found in the mediastinal connective tissue. In several instances cocci could be clearly recognized under the microscope when the focal plane was slightly shifted, but attempts to photograph were unsatisfactory.

The diplococci in these sections are morphologically identical with the diplococcus forms in exudates occasioned by the hæmolytic streptococcus. They are not in lymphatic vessels, but lie free in the interstitial lymph which circulates between the tissue elements. The fact that they are isolated and do not occur in groups seems to indicate that they were in transit, being actively transported from place to place by the flow of the fluid in which they were suspended. Had they become fixed in position, presumably their multiplication would have led to the formation of a group of organisms with the production of short chains. Furthermore, there would probably have been a more pronounced inflammatory reaction about the points where they had lodged. That they were present in these tissues during the life of the patient is evidenced by the œdema and fibrinous exudate frequently, but not invariably, found in the microscopical fields which contain the organisms.

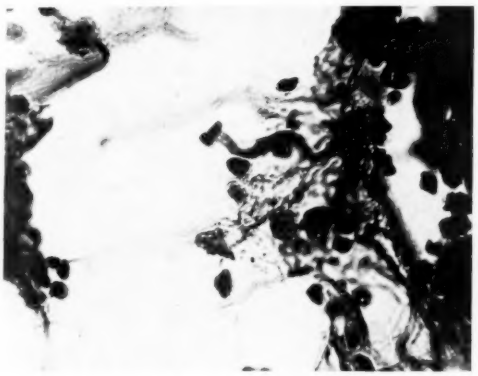

Fig. 10. A single diplococcus in adipose tissue at the hilum of the left lung. Cellular infiltration and fibrin. (Slide 6152–2-a, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

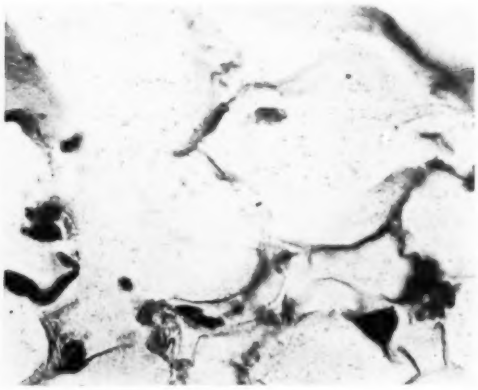

Fig. 11. Diplococci in adipose tissue, hilum left lung. (Slide 6152–212, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

In comparison with these observations, it is of interest to make a similar examination of the mediastinal tissues from a case in which a culture from the blood made before death revealed the presence of streptococci.

A section of the mediastinal fat from such a case is depicted in Figure 16. Here one of the two capillaries lying between the fat cells contains several diplococci and the blood is hæmolyzed. The other capillary is occupied by normal blood. There is no evidence of an inflammatory reaction in the tissues. Possibly, a single diplococcus came to rest in this position at the time of death in the one capillary and, the conditions being favorable, multiplied after the circulation of the blood had ceased and an inflammatory response to their presence was no longer possible.

Returning to the case in which the blood was sterile, it is of importance to study the condition of the parietal pericardium.

Figures 17, 18, and 19 are photographs of sections from regions where the pericardium overlies the mediastinal connective tissue. The exact localities from which these sections were made cannot be shown in Figure 8, because they lay in a plane somewhat anterior to the one represented by this photograph, but have been indicated as nearly as possible by the figure 17 on that diagram.

In Figures 17 and 18, a very early stage of pericarditis is shown. A septic œdema has separated the endothelial lining of the pericardium from the subjacent connective tissue of the mediastinum which is also the seat of œdema. Streptococci are numerous in the subendothelial fluid and are also present near the surface of the swollen fibrous tissue upon which the endothelium normally rested.

Figure 19 depicts a more advanced stage of pericarditis. The endothelial layer has not only been lifted away from its normal support, but is in process of disintegration. Upon the surface is a serofibrinous exudate in which streptococci are abundant. It is worthy of note that, although the underlying fibrous tissue is wholly denuded in a portion of this section, it is not invaded with micro-organisms in any degree markedly greater than was the case in the earlier stage of pericarditis shown in Figures 17 and 18. This suggests that the flow of the exudate toward the serous cavity

Fig. 12. Diplococci in a serofibrinous exudate into the fat and areolar tissue of the mediastinum. (Slide 6152–2-b, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

Fig. 13. Diplococci in a serofibrinous exudate into the fat and areolar tissue of the mediastinum. (Slide 6152–2-b, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

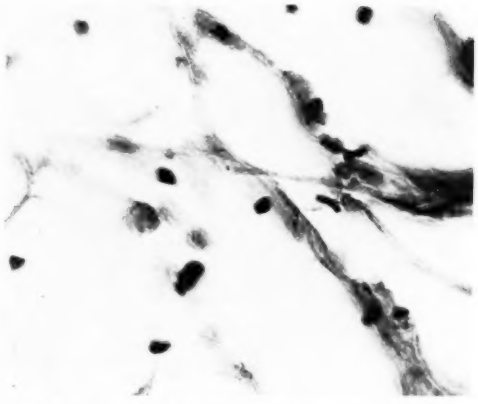

Fig. 15. Diplococci in a serofibrinous exudate into the fat and areolar tissue of the mediastinum. (Slide 6152–2-b, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

from these tissues protected them against particulate invasion.

The failure of micro-organisms to pass from a serous cavity into the surrounding tissues after productive inflammation has formed a "pyogenic membrane" of granulations is a matter of common experience and is readily understood so long as this membrane remains undisturbed. But the section through the parietal pleura depicted in Figure 20 suggests that the flow of a serous exudate toward the cavity during the inflammatory stages preceding these productive phases may serve as a protection against the entrance of micro-organisms. It is noteworthy that in cases of empyema the costal wall, external to the parietal pleura, is very rarely the seat of localized suppurations unless the result of trauma.

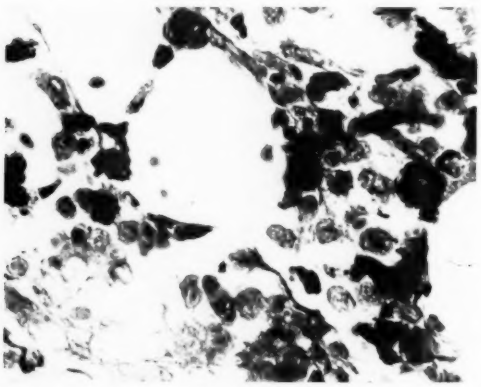

Fig. 14. Diplococci in a serofibrinous exudate into the fat and areolar tissue of the mediastinum. (Slide 6152–2-b, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

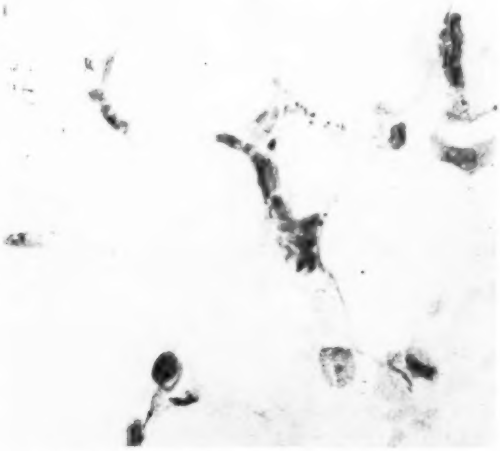

Fig. 16. Mediastinal fat in a case in which the blood contained streptococci during life. Two capillaries; one containing cocci and the remains of hæmolyzed corpuscles, the other without cocci or hæmolysis. (Slide 606–1, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

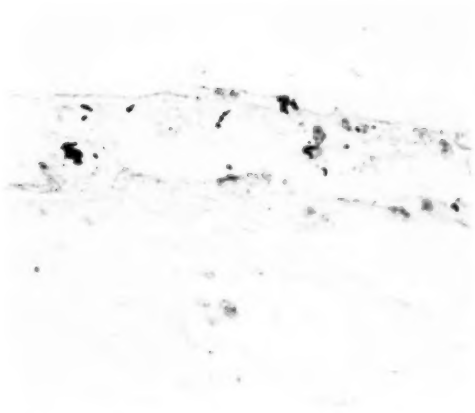

Fig. 17. Parietal pericardium overlying mediastinal connective tissue. Early stage of pericarditis, comparable with the early stage of pleuritis shown in Figure 6. (Slide 6152–1, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

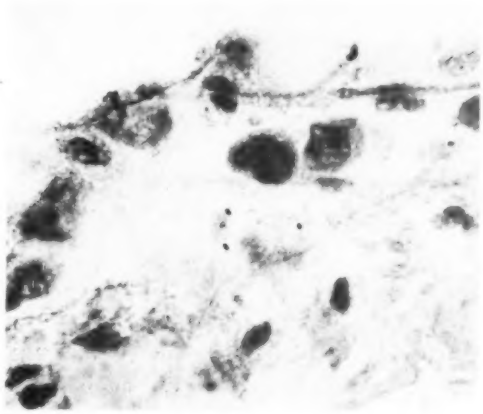

Fig. 18. Similar to Figure 17, but from a situation a little anterior. (Slide 6152–4, Negative 33027, Army Medical Museum.)

In Figure 20, the remains of the parietal pleura can be discerned as a necrotic strand, on one side of which the fibrinopurulent exudate within the pleural cavity contains innumerable streptococci. On the other side of this pleural vestige, no micro-organisms could be recognized with certainty in the serofibrinous exudate that separates the tissue elements forming the deeper layers of the parietal pleura. It is hardly conceivable that the damaged endothelium could in itself constitute a continuous and effective barrier against the passage of even non-motile bacteria. But the coagulations incident to the necrosis of that endothelium together with a flow of fluid, however sluggish, may perhaps suffice to explain the rarity of a transportation of bacteria outward from the cavity.

When the bacteria are primarily in the subendothelial tissues, these conditions are reversed, as is shown by the frequency with which pleural infections follow those of the lung, particularly when the offending organism is of a variety causing the formation of an abundant serous exudate.

The foregoing histological studies offer an explanation of that association of pericarditis with empyema revealed by the statistical data that preceded them. It remains to inquire whether this explanation can be extended to include the occurrence of peritonitis. This inquiry does not demand a search for micro-organisms along the possible paths of transmission; for it has already been shown that they come to lie in the interstices of the mediastinal tissues and it is known that because of some mode of transmission they are also present in the peritoneal exudate. It will suffice to show that the tissues intervening between the mediastinum and subperitoneal tissues are also the site of acute exudative inflammation. Such intermediate structures are represented by the external areolar coats of the aorta and œsophagus.

In the case of the aorta, that an acute exudative inflammation may occur is completely demonstrated by the section through this vessel shown in Figure 21. An abundant serofibrinous exudate occupies the meshes of the areolar tissue of the aortic adventitia which is continuous with that of the mediastinum and the subendothelial tissues of the peritoneum.

That the outer coat of the œsophagus may likewise be affected by an acute exudative inflammation is apparent upon inspection of gross specimens. An example is given in Figure 22. The wall of the œsophagus is greatly thickened and of a light gray color due to the infiltration with inflammatory exudate. In one of the protocols of a necropsy following

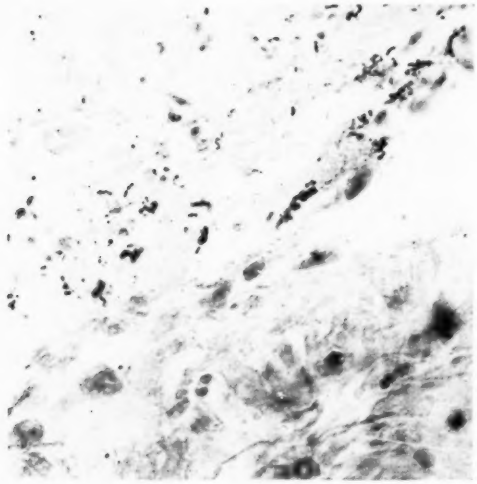

Fig. 19. Parietal pericardium overlying mediastinal connective tissue. Somewhat more advanced stage of pericarditis. (Slide 6152–4, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

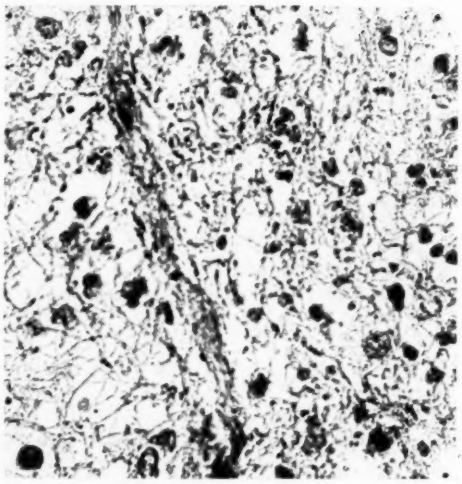

Fig. 20. Section through the parietal pleura, showing the septic seropurulent exudate within the pleural cavity and a serofibrinous exudate in the subendothelial tissues which are continuous with those in the mediastinum. The pleural exudate contains many streptococci. In the subendothelial exudate no micro-organisms could be found. (Acc. 6152, Army Medical Museum. Photographed at the Rockefeller Institute for Medical Research.)

empyema, this inflammation of the œsophagus was so striking that a special note was made of the occurrence of an acute œsophagitis.

In the cases of peritonitis associated with empyema, the inflammation is frequently confined to the upper part of the peritoneum, being described in the autopsy protocols as an acute fibrinous perihepatitis, perisplenitis, or a fibrinous agglutination of the stomach to neighboring viscera. In some instances, the subphrenic and perinephritic abscesses, which occur in the course of empyemata, may owe their origin to this route of infection.

A close analogy to this transmission of infection by way of the mediastinum is offered by the interstitial emphysema that starts in the lungs. The air gains access to the interlobular septa, appears beneath the pleura in beaded lines of bubbles, and passes on toward the hilum. Thence it enters the mediastinum and penetrates the fasciæ of the neck, whence it becomes manifest as a subcutaneous emphysema that may extend to the trunk and limbs.[1] The air is urged onward along this tract of least resistance by the respiratory movements of the thorax which are more vigorous than normal because of dyspnœa and coughing.

Interstitial emphysema was a not very rare complication of influenza and this fact raises the question: What antecedent diseases, other than pneumonia, occurred in the cases of empyema in which mediastinal infection was observed at autopsy? In answer to this question, the available data concerning influenza and measles have been brought together in Table IV and Figure 17.

Taken at their face value, these figures show that exactly one-quarter of the autopsied cases that died with empyema following influenza during the first 2 weeks after the incidence of the empyema had an infection in the mediastinum. The proportion falls to a little less than 1 in 15, when the antecedent disease was measles, but shows the same constancy during the first 2 weeks. The relatively high incidence of mediastinitis in empyema following these two epidemic diseases supports the view that they impair

[1] Dr. W. W. Roblee has reported a case occurring at the Embarkation Hospital at Newport News, while he was chief of the Medical Service, in which air was found at autopsy in the pericardial sac as well as in the mediastinal space and subcutaneous tissues. California St. J. Med., 1919, July.

Fig. 21. External portion of a longitudinal section of the aorta from a case of postinfluenzal infection at Camp Devens. There is an abundant serofibrinous exudate in the areolar tissue of the adventitia. (Section kindly loaned by Professor Wolbach of Harvard. Photographed at the Rockefeller Institute for Medical Research.)

the powers of defense against secondary infections.

Emphysema of the neck was noted in two of the cases of empyema included in this series (*vide* Table III). In one of these, an emphysema of the mediastinum was recorded in the protocol.

It is not obligatory to assume that the direction taken by the infected fluid within the mediastinum and contiguous areolar tissues must be identical with the normal flow of lymph, for this fluid is not confined to lymphatic vessels. It also occupies the interstitial spaces of the areolar tissue which may be likened to a sponge, the meshes of which in these cases of infection are constantly replenished with fluid derived from the damaged vessels and, at frequent intervals, urged by violent dyspnœic respiratory efforts or coughing to expel this fluid along any path which may be open.

Further consequences of infection of these tissue fluids would be the invasion of the areolar tissues of the neck and the eventual

Fig. 22. Coronal sections of lungs, mediastinum and œsophagus in a case of interstitial bronchopneumonia with septic œsophagitis. (Acc. 3300, Negative 30595, Army Medical Museum.)

entrance of micro-organisms into the circulating blood through lymphatic absorption. This access to the blood stream might be by way of the thoracic duct or might take place within an inflamed lymph gland where the

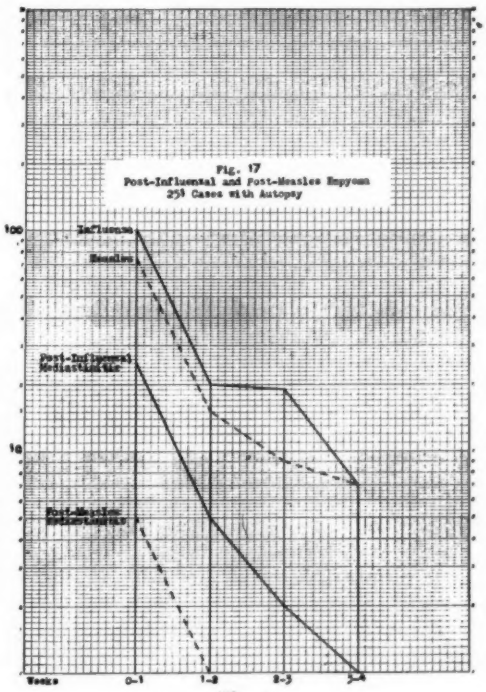

Fig. 23.

TABLE V.—EMPYEMA; STREPTOCOCCUS INFECTION

	Death 4th week after empyema	Death after 4th week
Mediastinitis	2	4
Bilateral pneumonia	13	24
Peritonitis	6	12
Pericarditis	13	11

lymphatic and blood vascular systems come into intimate relations with each other.

In conclusion, attention should again be directed to the fulminating character of the cases in which an infection of the mediastinal tissues was most frequently observed. Only those cases which died within the first 5 weeks after the inception of empyema have been included in the series studied. The incidence of mediastinitis declines rapidly in the successive weekly periods, terminating in two cases during the fourth week. If, however, all the cases associated with streptococcus which died more than 5 weeks after the recognition of empyema are gathered into a single group, it is found that infection within the mediastinum was found at autopsy associated with bilateral pneumonia and peritonitis in quantitative relations closely corresponding to those during the fourth week. The incidence of pericarditis, however, falls to less than one-half of the proportion maintained by the other conditions. The actual figures are given in Table V.

These later cases are too few in number, too variable as to the interval before death, and too incompletely recorded for a detailed analysis. It appears, however, justifiable to conclude that a general mediastinal infection is most likely to occur before the defensive reactions of the body are marshalled to impede dissemination of the infecting organisms, but that occasionally these defenses break down after a period of relative efficiency and that the course of events is then similar to that more commonly observed in fulminating cases, only less widely diffused.

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ROENTGEN DIAGNOSIS OF THE MORE IMPORTANT TUMORS OF THE LONG BONES

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MY attention was first called to the importance of the roentgen-ray diagnosis of bone tumors in 1917. Soon after our entrance into the world war I was assigned duty at Cornell University and there, under Major Frederick Baetger, we learned something of the limited views held by physicians concerning the interpretation of the pathology found in bone tumors. Several hundred physicians were prepared for X-ray work in the United States Army in a little over 1 year. We secured a remarkable collection of bone plates from the various hospitals of New York, representing practically all the types of bone tumors found in the literature. Many of these were accompanied by the history of the case, together with the pathological diagnosis after operation. From these we were able to make a very comprehensive study of the differential diagnosis of most bone tumors as depicted by roentgenograms.

It was surprising how much real diagnostic material could be obtained from many of these plates. The first impression gained from the observation of an X-ray plate of a bone tumor is simply one of bone destruction, of bone production, or of both, but many other aspects should be considered also, such as the location of the tumor, the condition of the cortex of the bone, the age and sex of the patient, the invasion of the soft parts, the point of origin, and the character of the destruction.

In order to interpret the value of these observations, a classification of bone tumors becomes necessary. This is best made by making four major divisions, under which each bone tumor may be classified according to its pathology. By this method the diagnosis in many instances may be either definitely made or limited to the possibility that the tumor in question is one of two or three types. In other words, diagnosis thus becomes a process of elimination. By this scheme bone tumors are classified by the following plan according to (1) their origin — whether medullar or cortical; (2) whether or not they are characterized by bone production, by bone destruction or by both; (3) the resultant condition of the cortex, whether expanded or destroyed; and (4) whether they are invasive or non-invasive in their growth.

CLASSIFICATION OF BONE TUMORS

I. *Origin*	a. Medullary	Sarcoma Carcinoma Hypernephroma Myeloma Fibroma Bone cyst Enchondroma Giant cell sarcoma
	b. Cortical	Periosteal sarcoma Osteosarcoma Osteoma Enchondroma Ossifying hæmatoma Myositis ossificans Bone cyst (rare) Exostoses
II. *Bone Production*		Periosteal sarcoma Osteosarcoma Osteoma Exostoses Ossifying hæmatoma Myositis ossificans Enchondroma Bone cyst after fracture
III. *Condition of Cortex*	a. Expanded	Enchondroma Bone cyst Giant cell sarcoma Fibroma
	b. Destroyed	Sarcoma Carcinoma Hypernephroma Myeloma Periosteal sarcoma
IV. *Invasion*	a. Invasive—all malignant tumors b. Not invasive—all benign tumors	

We shall be impressed by the ease with which bone tumors may be diagnosed roentgenographically by means of this simple classification. The first obstacle with which we are confronted is the fact that in certain

Fig. 1. Round cell sarcoma of ilium approaching sacro-iliac joint but limited in its extension by cartilage of joint.

Fig. 2. Tuberculous lesion of sacro-iliac joint showing extension of destructive process through the cartilage into the joint.

cases we may not be able to determine each of the points in this classification. For instance, in an advanced case we may not be able to determine the point of origin of the tumor or we may not be able to determine invasion, but usually two or more of these cardinal points may be learned from the pathology seen on the X-ray plate, and these will materially help in the process of elimination.

It is always possible to determine bone destruction and usually bone production as well. We must, however, remember that bone destruction is materially altered by surgical interference, as the removal of bone surgically and the disturbance of the periosteum with its consequent ossification changes the picture. Also trauma may do the same thing, as is shown in the healing of a bone cyst after pathological fracture. These points of diagnosis are not applicable to flat bones nor to vertebræ. The importance in many cases of seeking further aid is at once obvious.

What else may we learn from the roentgenogram? As stated above, we can always determine the location of the tumor; whether in the end of the bone, in the joint, or in the middle of the bone near the entrance of the nutrient foramen. This last location may be the deciding point in the diagnosis of carcinoma, which we know is always metastatic and is most often found near the point where the nutrient foramen enters the bone, while sarcoma is usually found in the end of the bone. Malignant tumors do not cross a joint, as cartilage seems to be a barrier to malignancy, so that a lesion involving both sides of a joint is always a benign process.

We can also determine whether the lesion is single or multiple. This point is often of great aid in the diagnosis.

The age of the patient can usually be quite accurately determined from the X-ray plate. This is an important observation because of the fact that sarcoma, while it may be found at any age, is most common during the periods from birth to the age of 40 years. Carcinoma, on the other hand, is seen most often after the age of 40; is extremely rare in

Fig. 3. Periosteal sarcoma of tibia.

children, and is only occasionally seen between the ages of 20 and 40.

Before discussing the analysis of the pathological findings in individual tumors, a brief consideration should be given to the development of bone tumors. A malignant tumor whose origin is in the medullary canal, develops by cell division and extends about equally in all directions; the growth is progressive and invades the cortex of the bone and the surrounding tissues, making an almost spherical tumor. This is in distinct contrast to infectious processes of bone which extend up and down the medullary canal, following the haversian canals and leaving areas of healthy bone or separating sequestra, thus making the lesion rather multiple in character. After the subsidence of the acute infectious process, marked new-bone formation is laid down at the periphery of the inflammatory lesion, thus producing a dense periosteitis and a thick cortex. This is both a reparative process and is nature's attempt at walling off extension of the lesion. In direct contrast to this protective process are the rapidly progressive malignant processes in which no abating of symptoms allows of

Fig. 4 (at left). Benign lesion of femur following a history of trauma.

Fig. 5. The bone lesion shown in Figure 4 after 4 months of X-ray therapy.

repair or of the limiting of the growth by new-bone formation.

The picture of benign bone tumors is again totally different from that presented by either malignant or infectious processes. Usually of medullary origin and slow of growth, the benign tumor gradually expands the bone and thins out the cortex. A small amount of new-bone formation at the periphery keeps the cortex intact. Also a thin dense line may be seen at the limit of the lesion in the medullary canal. These tumors are retarded considerably by resistance, consequently they tend to extend up and down the medullary canal, so that the growth presents a rather cylindrical contour.

These general considerations lead to a study of the pathological characteristics of the more important bone tumors.

Fig. 6. Syphilitic osteomyelitis of the humerus.

Fig. 7. Osteosarcoma of the humerus. Compare with Figure 3.

SARCOMA

Bone sarcoma may be of the round cell or spindle cell type; periosteal or osteosarcomatous in character; primary or metastatic in origin. We place giant cell sarcoma in the class of benign tumors from the fact that it seldom destroys the cortex of the bone and never metastasizes, although it has all the other characteristics of a true sarcoma.

Round cell sarcoma is a very malignant lesion with the following characteristics: The tumor is medullary in origin, contains no new bone, but shows a marked destruction in all directions. It breaks through the cortex of the bone, and invasion of the soft tissue results. These tumors may be found anywhere in bone but are usually seen in the ends of the long bones. Round cell sarcoma does not cross a joint, since as we have stated above the cartilage seems to be a barrier to its growth. Figure 1 illustrates a round cell sarcoma approaching a joint but limited by the cartilage on the side of the ilium. At the lower portion of this growth the whole bone has been swept away by the extension of the growth; but the sacral side of the joint is not involved. Contrast this with Figure 2, which shows a tuberculous lesion of the sacroiliac joint, in which the destructive process has attacked the joint itself and has destroyed the cartilage on both sides. Round and spindle cell sarcomata and tuberculosis are the only purely destructive lesions of bone which are unaccompanied by any new-bone production. When this type of pathological lesion is found, we are usually able to determine whether the lesion is malignant or benign, but it is difficult to know whether the growth is a sarcoma or a carcinoma. But differential diagnosis is aided by the fact that a sarcoma of this type most often occurs before 30 years of age, while carcinomata are metastatic and occur later in life. A combination of the roentgenological findings with the history will, in most instances, lead to a correct diagnosis.

Spindle cell sarcoma presents most of the characteristics of round cell sarcoma, but is

Fig. 8. Giant cell sarcoma of the upper end of the humerus of 10 years' duration.

less invasive, and the roentgenogram presents the appearance of some limitation, especially in the medullary canal where a slightly denser area appears at the periphery of the growth. These tumors do not metastasize as readily as do the round cell sarcomata. They may be mistaken for osteomyelitis in their early stages. In general, all the diagnostic points of round cell sarcoma apply equally to spindle cell sarcoma.

Periosteal sarcoma originates in the periosteum as the name implies. A striking characteristic of this type of tumor is the method of bone production, in which the new bone is laid down in striæ, perpendicular to the shaft. The deposit of new bone is entirely in the soft tissues and does not reach the bone proper (Fig. 3). The cortex may be destroyed later in the disease. These tumors are most often seen before 30 years of age, and like all malignant tumors they are invasive in character. These tumors, however, may be simulated very closely by some benign types of bone pathology, such as periosteal reproduction after trauma as by a blow on the tibia from a kick or severe fall. Dr. Bloodgood calls attention to the importance of the physical examination in these cases. Unlike sarcomata, the soft tissue is not indurated or swollen, but is freely movable over the tumor. Figure 4 illustrates this type of benign growth simulating a periosteal sarcoma. Figure 5 shows the same tumor after 4 months of X-ray therapy.

Fig. 9. Bone cyst of head of ulna showing expansion and thinning of cortex.

Syphilis also may simulate periosteal sarcoma, but in syphilis the new bone is usually

Fig. 10. Bone cyst of head of humerus with pathological fracture.

laid down parallel to the shaft, and if the characteristic lace-work formation is also present no mistake should be made (Fig. 6).

Osteosarcoma is usually cortical in origin. Bone production is pronounced and as in periosteal sarcoma the new bone is deposited in striæ perpendicular to the shaft, but unlike the latter in osteosarcoma, the new-bone formation is found within the tumor as well as in the invaded soft tissues (Fig. 7). In general, the degree of malignancy may be determined, to a considerable extent, by the amount of new-bone formation; the more malignant the type the more rapid the growth and in consequence the more limited the bone formation.

Bone destruction is seen early; the cortex is destroyed and the medullary canal is invaded.

The cortical destruction, the character of the new-bone formation, and the picture of invasion are the most important points in diagnosis.

Exostosis or osteoma need not be confused with sarcoma, as the former presents a definite outline with no semblance of invasions. Early in this disease it may be difficult to establish the diagnosis before the cortex is broken through. Osteomyelitis, cysts, or myelomata may all have to be ruled out. Osteomyelitis is usually accompanied by pain, while an initial chill with the clinical history of an acute infection and later redness and swelling of the soft parts establish the diagnosis. Myelomata and cysts expand the cortex, show no new-bone production and are quite regular in their outline. Their growth is slow as compared with the rather rapid development and usual early destruction of the cortex which are characteristic of osteosarcomata. Myelomata are multiple lesions. However, there is a type of osteosarcoma which arises from the periosteum and shows little involvement of the cortex, but it surrounds the bone presenting the appearance of an invasive tumor interrupted with areas of cartilage and bone.

CARCINOMA

Bone carcinoma is always metastatic and is medullary in origin. Most often it is seen at the middle of the bone at the point of entrance of the nutrient foramen. There is no bone production, only bone destruction. For this reason, carcinoma may be confused with tuberculosis, which also destroys bone without bone production, except when found in the shaft of the bone, these being the only

Fig. 11. Fibroma of phalanx.

two bone lesions of the pure destructive type. Tuberculosis, however, almost always involves a joint, usually having its origin in the cancellous end of the bone and rapidly extending to the joint. When it is found in the shaft of bone, it has all the characteristics of osteomyelitis. Carcinoma, on the other hand, never involves a joint. This fact aids materially in the diagnosis. The cortex is swept away without any attempt at expansion. The tumor extends equally in all directions. Carcinoma of bone is almost never found below the elbows or knees, and is essentially a disease of the later period of life. It is also the most common type of bone tumor found in the female sex after 40 years of age. This latter point aids us in the differential diagnosis between carcinoma and round cell sarcoma, the latter of which may be primary and is found at any age.

Fig. 12. Osteoma of femur with exostosis on opposite side.

Fig. 13. Osteoma of fifth metacarpus.

MYELOMA

Myelomata are true bone tumors and occur simultaneously at different locations in the osseous system. They are always medullary in origin. Two cases seen — postmortem — by MacCallum showed elevation of the cortex, erosion and protrusion of the growths. On roentgen examination these tumors should give first the appearance of expansion and later of destruction of the cortex. Pathological fractures and atrophy of the surrounding bone often result from these lesions. There is no blood picture which is characteristic of these lesions, but Bence-Jones bodies are always present in the urine. This latter finding together with the multiple lesions and the absence of metastases renders possible the diagnosis of this type of bone tumor.

BENIGN TUMORS

Giant cell sarcoma is a benign tumor usually medullary in origin. It does not produce new bone in its growth, but shows marked bone destruction. The cortex is intact, but is expanded. The origin usually is in the medullary canal but may be periosteal, in which case the growth is covered with a thin layer of bone. The tumor apparently grows equally in all directions and is usually found in the end of the long bones (Fig. 8). They are usually found after middle life. These

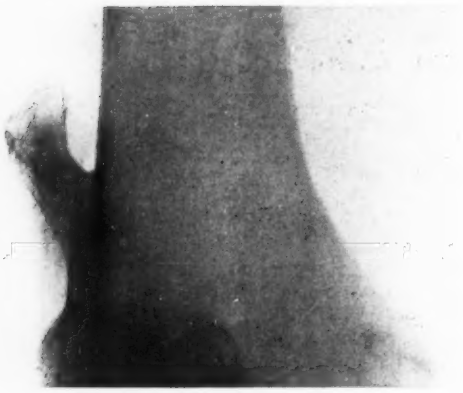

Fig. 14. Exostosis of the lower end of femur.

tumors do not metastasize, but are single lesions, although they have a multilocular appearance and must be differentiated from bone cysts and fibromata.

Bone cysts are medullary in origin and produce marked bone destruction. They tend to extend up and down the medullary canal, expanding the cortex, and at the same time thinning it out, so that they present a cylindrical contour and often cause pathological fracture (Fig. 9). According to my experience, bone cysts are always single; that is, only one bone of the body is involved. They are usually multilocular, however, and found in the end of long bones. These tumors occur in early life. Figure 10 is an illustration of a bone cyst with pathological fracture.

Fibromata are rare. They destroy bone, are medullary in origin, and occur as single tumors. They thin out the cortex but do not destroy it. No new bone is formed, and the cortex does not expand. They show one single area of destruction and are not multilocular as are bone cysts (Fig. 11).

Chondro-osteoma and osteochondroma, as the names signify, present either a preponderance of cartilage over bone or of bone over cartilage. These tumors are either medullary or cortical in origin. They produce bone destruction with expansion of the cortex so that a cylindrical tumor results. They are usually multiple and are probably the result of the latent growth of bits of cartilage left in the bone during its development. Pathological fractures are common. Both bone destruction and bone production are present. These tumors are definitely limited and are readily diagnosed from a roentgenogram as benign lesions.

Fig. 15. Myositis ossificans.

Osteomata are cortical in origin and show marked bone production without bone destruction. They are simply lawless growths of bone which sometimes contain bits of cartilage, which on the roentgenogram appear as areas of lesser density. They extend directly from the shaft or the body of the bone and may be found anywhere. They do not invade the tissues but push them aside to make room for their growth (Figs. 12 and 13).

Exostoses are bony growths from the cortex extending out from the body of the bone and pointing away from the nearest epiphysis. They are long and narrow and may have an osteoma on the end (Figs. 13 and 14). They are benign in character, and offer little difficulty in diagnosis.

Ossifying hæmatomata are cortical in origin and are not connected with the bone. They show calcification which presents the appearance of new bone in the tissue. The striæ are laid down parallel to the shaft of the bone. This lesion is not a tumor, but may have to be considered in making a differ-

ential diagnosis. The condition is the result of an injury with hæmorrhage beneath the periosteum, which limits the outline.

Myositis ossificans is a lesion in which new bone is present in the muscle where it is deposited parallel to the shaft of the bone (Fig. 15). It is easily differentiated from bone tumors. This lesion, as has been stated by Sir Robert Jones, is usually due to trauma as the result of which bits of periosteum have been torn off in an evulsion fracture, and have later produced new bone in the muscle.

TUBERCULOSIS

Tuberculosis of bone is usually of joint origin, if not, it is a definite osteomyelitis. Destruction of bone without bone production is the characteristic appearance. As we have stated above, the cartilage is attacked and both sides of the joint are involved, tuberculosis thus presenting a picture the opposite of that found in carcinoma or in round cell and spindle cell sarcoma. The cortex of the bone is swept away which is not the case with the benign tumors of bone in which only bone destruction is present.

There is, however, one type of tuberculosis to which careful consideration must be given, and that is *caries sicca*. This is a form of tuberculosis of the joints occurring after 40 years of age, and the characteristic of which is marked atrophy of the bone and soft tissues about the joint, the areas of destruction simulating gouged-out bits of bone about the joint. The diagnosis is aided by the fact that although this condition is a joint lesion, yet there is present no swelling, haziness, or fluid.

SYPHILIS AND OTHER TYPES OF OSTEOMYELITIS

These conditions show marked periosteitis extending parallel to the shaft of the bone. In syphilis this may appear as the typical lacework periosteitis which is pathognomonic of lues. The cortex may be broken through at several points. The lesion usually extends along the bones, separating islands of healthy bone (Fig. 6). Sequestration is present in advanced cases. These points with the history of the case aid much in diagnosis. The Wassermann reaction is often negative in cases of bone syphilis, so that it cannot be relied on for diagnosis. If surgical intervention has destroyed bone or disturbed periosteum, this whole plan of diagnosis becomes useless.

It is my hope that these few classifications and groupings of pathological findings as used in the section of roentgenology in the Cleveland Clinic may be of some aid in the diagnosis of bone tumors.

EMPHYSEMA OF THE SCROTUM THE RESULT OF DIVERTICULITIS OF THE SIGMOID WITH PERFORATION

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EXTRAVASATION of urine into the subcutaneous tissues of the perineum and scrotum is so often seen in traumatic surgery that it occasions little comment, but the introduction of air, either directly or indirectly, into these tissues is rarely observed. Fuller, in his book on genito-urinary diseases, quotes Verneuil as having made some observations on the latter condition, and divides it into two types; first, gas distention by air from wounds adjacent to the scrotum or connected with distant wounds communicating with the air passages, and second, gas distention due to the invasion of the tissues by gas-forming organisms; this type is obviously much more serious and more often fatal than the first type.

The urinary extravasations follow a very definite route, owing to the arrangement of the fascial planes in the perineum through which the urethra passes. Generally, in cases in which the urine infiltrates the tissues as a result of direct trauma applied to the perineum, the urethra is driven upward against the pubic arch and lacerated. The bulboperineal portion is the usual point of injury, and the relation of the rupture to the triangular ligament determines the course of the extravasation. This urogenital diaphragm, the base of which enters the central tendon of the perineum and the lateral attachments of which are the rami of the ischium, and pubis, is continuous with both the superficial perineal fascia and the deeper pelvic layer. Should this trauma rupture the urethra then posterior to the ligament, the extravasation must necessarily be backward and downward, while a break in front directs the course forward and upward infiltrating the tissues of the anterior part of the perineum and scrotum and even extending well up on the abdomen. That this usual route was followed in our case seems logical despite the fact that there was a communication between the sigmoid flexure of the colon and the urinary bladder, as operation verified. The patient was aware of having passed gas by the urethra, once several weeks before examination in the Clinic and once the night before operation.

Owing to peculiar anatomic arrangements it seemed highly improbable that gas had made its way into the bladder and thence into the subcutaneous tissues of the scrotum; that another perforation, or leakage from the same one had occurred and had burrowed through the peritoneum and under the fascial layers to emerge in front of the triangular ligament and infiltrate the adjacent subcutaneous tissues, seems the obvious deduction.

REPORT OF CASE

Case A376337. Dr. F. L. A., age 46, registered at the Clinic November 11, 1921. He complained of pain and soreness in the left lower quadrant of the abdomen. The pain had appeared 3 years before and had been at first, sharp, shooting, and confined to the lower left quadrant, but later it radiated into the perineum and crossed the entire lower abdomen. The patient had been nauseated but had not vomited and had had only a slight rise of temperature, 100 being the highest. At the first attack there had been no tenderness to pressure, and residual tenderness had not been noted; the patient had been able to resume work at the end of 3 days. After this the attacks were intermittent for 8 months. He did not have a recurrence for about 2 years, when the attacks began to occur more frequently and with increasing severity. The pain increased so that 2 grains of morphia a day were required to control it. There had been no blood in the stools nor had constipation been a factor, although the patient complained of more uneasiness in the pelvis when the bowels were not loose and of considerable discomfort on defæcation. Pain and sense of pressure were usually quickly relieved by bowel movement. Six weeks before examination a new syndrome appeared which added greatly to his distress. He began to have frequency and burning pain on urination, especially at the end; this was greatly aggravated by exertion, even the movement of riding in an automobile. He had not found blood or gravel in the urine although constantly alert for one or both, and his previous history was entirely negative to any genito-urinary disturbance.

The patient's general physical examination was practically negative. His general appearance was

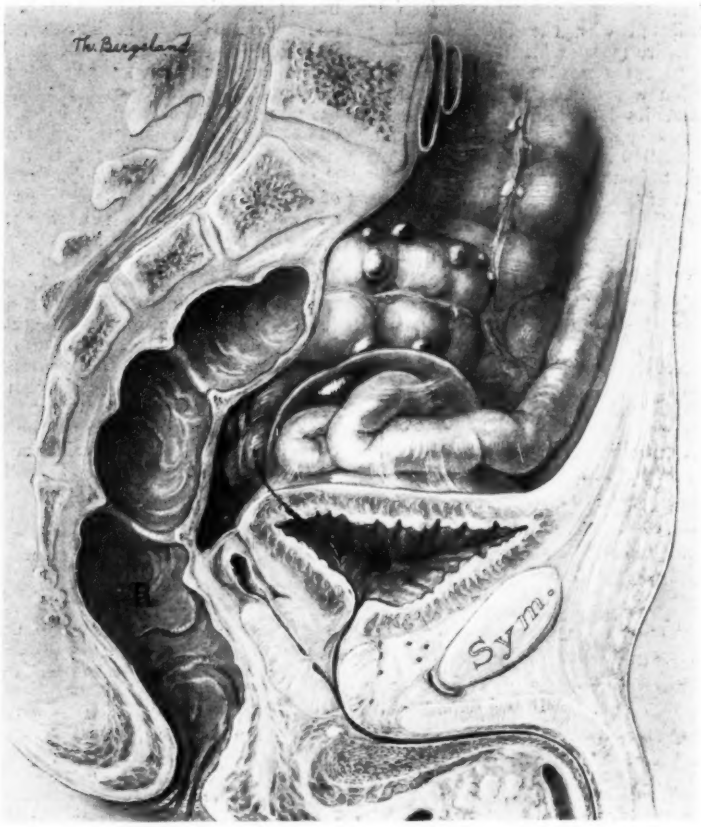

Fig. 1. Diverticula of the sigmoid above the mass which is attached to the lateral wall of the bladder. The loop of the ileum is adherent. There is a fistulous opening between the bladder and sigmoid.

that of a robust man not accustomed to much physical exercise. He weighed 205 pounds; his normal weight was 215. The systolic blood pressure was 122, diastolic 80. The pulse was 90, and the temperature 99.4°. The specific gravity of the urine was 1.013, the reaction acid, albumin 1, red blood cells 1, and pus 3. The combined phenolsulphonephthalein test was 50 per cent, and there was one-half ounce residual urine. The leucocytes numbered 7,300, the erythrocytes, 4,550,000, the hæmoglobin was 74 per cent.

The roentgenological diagnosis was obstruction in the sigmoid flexure. No definite conclusion could be reached from the proctoscopic examination. Digital examination of the rectum met an obstruction, principally on the right side about 3½ inches from the anal orifice; the examining finger could not reach beyond it. The prostate was enlarged, 2, bilaterally. It was not thought advisable to make a cystoscopic examination although from the roentgen-ray findings, the history and the rectal examination a tentative diagnosis was made of diverticulitis of the sigmoid attached to the bladder causing a severe secondary cystitis and producing an intermittent fistula. Malignancy was considered as a remote possibility (Fig. 1).

Operation. November 9, 1921, under ether anæsthesia, the abdomen was explored through a low left rectus incision. A mass 9 centimeters in diameter was located deep in the pelvis and identified as the sigmoid. The local growth appeared to be entirely inflammatory. It was attached to the left lateral wall of the bladder far down in the pelvis; it was doubled on itself and encroaching on the rectum. Multiple diverticula of the sigmoid above the growth could be demonstrated. A loop of the ileum was

adherent in the mass; it was not removed for fear that it communicated with the sigmoid, and a resection of the entire mass seemed too formidable an undertaking to carry out in one stage. The lumen of the colon was obstructed, causing it to baloon throughout its left half, thus adding an additional argument against an initial resection. Consequently a preliminary colostomy was made with the hope that sidetracking the growth would permit a recession of the inflammatory process and reduce the obstruction. This, while prolonging the convalescence and making a two-stage operation, would bring the risk to a minimum. Accordingly a loop of the descending colon was fastened into the upper angle of the wound after a modification of the Mixter method, leaving the decision of future operation open.

Postoperative course. The immediate convalescence was uneventful. The patient complained very little of gas pain and altogether was not very uncomfortable. The colostomy had not been opened. On the eighth day, the patient complained of quite severe gas pain and suddenly in the afternoon noticed that his scrotum began to swell painlessly, but at a noticeable rate. Within 2 hours it was about 30 centimeters in diameter, and air crackles were quite distinct. It seemed certain that the condition was in no way connected with urinary extravasation since the patient voided with ease and the physical appearance and feel of the tissues were characteristic. The fact that a fistula was known to exist between the bladder and bowel did not explain the condition, since it offered no anatomical method of bringing about an emphysema. There was no extension on the abdomen, which, however, was considerably balooned with gas, and on which peristalsis could be noted. The loop of bowel in the colostomy wound was cut across, thus immediately relieving the abdominal distention and sidetracking the fæcal and gas currents. There was no further increase in the emphysema of the scrotum but it was exceedingly slow in returning to normal; 2 weeks elapsed before its reduction was complete. Except for a somewhat aggravated cystitis, the patient was none the worse for the unusual complication. He returned home with the open colostomy and with the advice to wait several months before having the second stage of his operation carried out.

POSTTRANSFUSION REACTIONS

Alterations in Blood After Ether Anæsthesia and After Blood Transfusion

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THE history of blood transfusion previous to the present era, which really began with Crile's epoch-making work in 1906 (10), consists of several short periods during which the usefulness of transfusion as a therapeutic measure was enthusiastically endorsed, and long intermissions during which it was considered a hazardous procedure. Based upon a number of fortunately successful cases and upon attractive but for the most part erroneous theories, the legitimate importance of blood transfusion took on the aspect of a "cure-all" and a life-saving device in all serious diseases; and, therefore, came to be used in as great, if not a greater variety of conditions, as may be found in a modern list of indications. Indeed, its sphere of usefulness was extended to the soul, for Cardamus in 1556 advocated that people hopelessly immoral should be transfused with blood of those strongly moral (Jones, 18). A comparison between the practice of transfusion before the present era and its practice with modern methods can only excite wonder and a certain degree of admiration for the courage and skill of our forebears, who, in total ignorance of aseptic methods and working with inferior instruments and technique, were able to obtain some encouraging results. But these deficiencies in their knowledge may be taken to account for both their courage and for the failures, which, at the end of each successful period, stamped transfusion as a dangerous operation and eliminated it from practical therapeutics, until in some future generation interest in it was again revived and success, enthusiasm, failure, and resultant condemnation were again repeated.

The investigations and clinical applications of blood transfusion reported by Crile (10 and 11) excited much scientific interest throughout the entire world. Since then, the technique has been greatly perfected by the introduction of the Lewisohn (23), Lindeman and Unger (44) methods and their modifications. Landois in 1875 was the first to discover that the dangerous results following transfusion were due to the fact that the fresh serum of an animal of one species could dissolve the red cells from an animal of another species. The researches of Landsteiner (21), Jansky (17), Hektoen (16), Ottenberg (31), and Moss (28), explained the nature of the dangerous, often lethal, posttransfusion reactions, and made it possible to test for the compatibility of donor's and recipient's bloods previous to transfusion. Furthermore, fair and rational estimation of results obtained from transfusion in various conditions has eliminated many cases in which the measure is useless, and has thus diminished the number of failures. The true indications for transfusion have thus been placed in greater relief; and hence its usefulness is now better appreciated.

Blood transfusion must, therefore, remain permanently as a therapeutic measure of highest value and very great importance.

Whereas the technique of transfusion is now very efficient, and its sphere of usefulness is now well understood, the problem of eliminating posttransfusion reactions has been successfully dealt with only in its grosser phases. For, in spite of pretransfusion tests for compatibility of donor's and recipient's bloods, posttransfusion reactions continue to occur. From our observations, and from an examination of the literature, we have come to the conclusion that inaccurate testing cannot account for all the reactions, but that they occur very frequently, even after the bloods have been properly matched and found suitable.

Alterations in Recipient's Blood After Ether Anæsthesia

The attention of one of us (Levine) was attracted to a hitherto unreported cause of reaction, by a number of experiences with

transfusion for postoperative replacement of blood. In such cases, if the possible necessity of transfusion is foreseen previous to the operation, a suitable donor may be chosen and held in readiness, to be used at any time during or after the operation. If the necessity of transfusion is perceived only during or after the operation, and if the group of the patient is known, a suitable donor of known group may be obtained; but if the patient's group is not known, possible donors may be quickly summoned, the bloods of the donor and recipient tested, and a suitable donor chosen. Some operators who do transfusions are satisfied, in cases of emergency, to choose the nearest relative as a donor and proceed to perform the transfusion without previous testing of bloods; although this latter procedure is unscientific and unsafe to the patient, it is permissible in the most extreme cases of emergency.

CASE 1. In September, 1919, at the Royal Victoria Hospital, it was found necessary to do a transfusion on Mr. H., 60 years old, after he had undergone a radical Kraske operation which lasted 2½ hours. Anæsthesia in this case was begun with gas and oxygen and continued with ether. Almost immediately after the operation some blood was withdrawn from the patient and centrifugalized. The serum, which had a pinkish tinge—probably due to some hæmolysis—was matched with the red cells of the donor, this patient's 24-year-old son, a well-built man in good health; marked agglutination occurred within 30 minutes after the test had been set up. Twenty-four hours later some blood was again taken from the patient, and the serum obtained was plainly straw-colored without any pinkish tinge. The test was repeated with the red cells from the same donor; there was no agglutination evident, even after 12 hours' incubation at 37°C.

CASE 2. In June, 1920, the necessity for transfusion after operation was deemed possible in the case of Mrs. A. C., who was to undergo a laparotomy for gall-bladder disease. The direct test was performed, matching her serum with her husband's red cells and *vice versa*. No agglutination occurred. The operation lasted 2 hours, ether being used as the anæsthetic. Profiting by the experience of Case 1, some blood was withdrawn from the patient immediately after the operation. The serum obtained by centrifugalization presented a pinkish tinge. The test was repeated and marked agglutination of donor's cells by recipient's serum was observed within the first half hour after the test had been set up. Twenty-four hours later the test was again made with fresh serum (which lacked the pinkish tinge), and no agglutination occurred. Eleven days after the operation 400 cubic centimeters of citrated blood, taken from her husband, were transfused. No untoward symptoms followed.

CASE 3. On November 7, 1921, the blood of Mrs. A. K., age 41, was tested by matching it with cells of several donors, and a suitable donor was found. On November 8, Doctor Archibald performed the Lilienthal operation for resection of carcinoma of the œsophagus. Anæsthesia was begun with gas and oxygen and continued with ether. The operation lasted 2½ hours. At the end of this time, and while the patient was still well under the anæsthetic, some blood was withdrawn, and the serum obtained by centrifugalization of the blood presented a pinkish tinge, which was not present in the serum obtained previous to the operation. The test was repeated and marked agglutination of donor's cells by recipient's serum occurred within 15 minutes after the test had been set up. Twenty-four hours later the test was repeated; a clear straw-colored serum was obtained and there was no agglutination. No transfusion was done in this case.

The cases of transfusion for postoperative replacement of blood which we were able to find in the literature were not reported with the necessary details of the duration of anæsthesia, the color of the centrifugalized serum and the results of tests before and after anæsthesia; so that they cannot be used for the purposes of this discussion.

The observations made on these three cases point to a definite phenomenon, namely, that a long operation in which ether is used as the anæsthetic alters the patient's serum as regards its hæmoagglutinin properties. Furthermore, this change is not a permanent one but disappears during the first 24 hours after the operation, i.e., just about the time when the patient has recovered from the effects of the ether anæsthesia.

Several hypotheses may be considered in attempting to explain the nature and cause of these phenomena. It may be possible that lipoids liberated from the tissues and taken up by the blood are responsible for the agglutination immediately after prolonged anæsthesia, and that when these lipoids have been excreted from the blood, the serum again behaves as before the operation. Another possibility is, that the organic products of surgical shock may be responsible for the temporary alteration in the hæmoagglutinins of the blood. Then, again, the ether that is present in the blood, by its own action,

or by substances or effects which it produces in the blood may be the cause of the change. This latter hypothesis is supported by the presence of a pinkish tinge in the serum obtained by centrifugalizing blood withdrawn immediately after prolonged ether anæsthesia—this pinkish tinge being due to hæmolysis of red cells most probably caused by the ether present in the blood.

Furthermore, Professor Oertel has suggested to us that ether being a lipoid solvent, the alteration in the colloidal state of the blood which it produces is most probably the cause of the changed hæmoagglutinin and hæmolysin phenomena which are themselves also colloidal in nature. Professor Bruère corroborates this opinion from his experience with the Wassermann reaction. He has observed that the presence in the blood of substances which alter its colloidal state interfere with the reaction. Thus blood withdrawn several hours after a meal, and containing products of digestion is unreliable for the purposes of the Wassermann test. Indeed, he has found that if blood has been taken during or immediately after ether anæsthesia, the proper results are not obtained.

A more complete discussion of the nature and cause of these phenomena, we postpone until we will have completed the investigations that we are carrying on. Our observations have, however, taught us a valuable practical lesson, namely, that in practicing postoperative transfusion for replacement of blood, especially in cases following prolonged ether anæsthesia, it is essential to match the patient's serum with the donor's red cells and *vice versa*, after the operation; and that it is necessary to wait at least 24 hours before taking the sample of blood for serum from the patient. This necessitates postponing the transfusion for at least 24 hours, during which time the patient may be benefited by glucose or saline injections.

ALTERATIONS IN BLOOD AFTER TRANSFUSION

Certain conditions, such as the anæmias, hæmaphilia, purpura, leukæmia, and others often call for more than one transfusion.

In 1913, Ottenberg, Kaliski and Freedman, (32), from experiments on animals, concluded that multiple transfusions from a given donor to a given recipient caused the development, in the latter's blood, of specific agglutinins and hæmolysins against the donor's cells which were originally not present.

Ottenberg and Libman (33), in 1915, were the first who from clinical observations pointed out the danger of posttransfusion reaction following the second, or subsequent, transfusions from a given donor to a given recipient, even when the test previous to the first transfusion proved the bloods to be compatible, and, moreover, even when no reaction followed the first transfusion. Two years later (24) the same authors emphasized "the necessity of doing tests again if transfusion is repeated even if the same donor is used." They reported that they had "seen several instances in which a patient developed new agglutinative and hæmolytic powers toward the blood cells of a donor to whom he had not originally been agglutinative or hæmolytic. In one of these cases, a young man, suffering from hæmophilia, a first transfusion of 50 cubic centimeters by the syringe method was followed by no reaction whatever, and the tests showed absence of hæmolysis or agglutination. A month later, an identically similar transfusion of the same amount of blood was followed by an immediate reaction, consisting of partial collapse, nausea and vomiting, generalized urticaria, violent headache and hæmaturia. Blood obtained from patient and donor a few days after this occurrence, showed that the serum of the patient was now strongly agglutinative to the cells of the donor. It was not determined whether the agglutinin present was due to the patient having changed his group (a hitherto undescribed occurrence), or to the development of a new immune iso-agglutinin."

In 1917, Minot and Lee (27) reported three cases of reactions after repeated transfusions, "in one case, the third transfusion, using the same donor as in the first transfusion, was followed by a marked reaction which hastened death. The donors and recipients in all cases belonged to the same groups." Another very striking example was reported by Thalhimer, (43) in the case of a boy aged 6 years, suffering from purpura.

By the direct method of testing donor's and recipient's bloods, the father was found to be a suitable donor and 300 cubic centimeters of citrated blood were transfused; a slight reaction consisting of a transitory rise in temperature to 103° followed immediately after the transfusion. About 3 weeks later, using the same donor without again testing the bloods, a second transfusion was given, when 150 cubic centimeters of citrated blood were injected. The patient developed tingling of face, legs and feet, then burning of feet. There followed flushing of face, the skin became diffusely peppered with pin point hæmorrhagic spots. With the appearance of pallor the pulse became almost imperceptible. The transfusion was stopped, and very soon the pulse acquired good volume, but it remained very rapid (about 140). About half an hour after the beginning of the reaction the patient was in fairly good condition and was returned to his room. Shortly afterward, however, he had a severe chill, temperature rose to 102.6° and he vomited undigested food. He complained of marked difficulty in breathing which was irregular, deep and jerky. Pain in the abdomen was so severe that the bed clothes had to be lifted off because their weight intensified the pain. About 2 hours after the transfusion, the patient voided about 6 ounces of very dark hæmoglobinuric urine. Ten hours later he again voided similar, but somewhat lighter urine, and 4 hours after this his urine was pale yellow, but it still contained a considerable number of hæmoglobin-tinged, coarsely granular casts which were very abundant in the first two specimens and which did not disappear until the third day after transfusion. At no time were red blood cells found in the urine.

Our attention to this phenomenon, of a reaction after the second transfusion from a given donor to a given recipient, was first attracted by the following two cases in the series of transfusions performed at the Royal Victoria Hospital:

CASE 1. Mr. X age 45, suffering from pernicious anæmia, was given 500 cubic centimeters blood from a tested suitable donor on January 27, 1919. No noticeable clinical reaction followed. On March 7, 1919, without again testing the donor's and recipient's bloods, the patient was given 700 cubic centimeters blood from the same donor as was used for the first transfusion. Two hours after the completion of this second transfusion, the patient had a violent chill, during which his temperature rose to 105° F. The lips and mucous membrane of the mouth became œdematous, breathing was labored and the pulse small and thready. A specimen of urine passed soon after the onset of these symptoms showed the presence of a small amount of blood. The acute symptoms gradually disappeared; 2 days after the transfusion a slight degree of jaundice became evident, but this feature also diminished until it became hardly noticeable when the patient was discharged in good condition about 2 weeks after the transfusion.

CASE 2. M. K., female, age 21, admitted for ruptured ectopic gestation with large hæmorrhage. On September 21, 1920, she received 540 cubic centimeters of blood from a tested suitable donor. Immediately after the transfusion the patient experienced a chilly sensation which lasted for about half an hour. No other untoward symptoms or signs occurred. She was operated upon on September 22, and a second transfusion was performed on October 15, using the same donor as for the first, depending upon the compatibility of the bloods as determined by the test of recipient's serum against donor's cells and *vice versa*, performed before the first transfusion. Moreover, no doubt as to the compatibility of the bloods was entertained, since nothing unusual occurred after the first transfusion that could have aroused suspicion. The second transfusion consisted of 550 cubic centimeters of blood. Almost immediately after the operation was completed a violent reaction began. The patient experienced a severe chill, with a rise in temperature from 97° to 105° within 15 minutes, and cyanosis, labored breathing, a thready weak pulse which could not be felt during rigor, and vomiting of a considerable amount of blood-stained material quickly followed. She also complained of severe dull pain in the lumbar region. Blood oozed from the mucous membranes about the mouth, especially from the gums. About 7 hours after the transfusion she vomited a considerable quantity of dull, red fluid and clotted blood. There was also some slight but continuous hæmorrhage from rectum and vagina, and blood was found in a catheter specimen of urine. The very acute symptoms, namely, the chill and general signs of shock, gradually disappeared but the patient remained quite sick, vomiting of blood-stained food, oozing of blood from buccal mucous membrane and from rectum and vagina continued until October 20, and then suddenly ceased. The vomiting gradually diminished in frequency from five to six times a day to once a day, but it was not until October 30, seventeen days after the transfusion, that it ceased completely. On October 20, the patient's face appeared puffy. She was given an intravenous saline of 30 ounces on October 27, and following this she improved rapidly until November 6, when she was discharged in good condition.

On the other hand, it must be borne in mind that not every transfusion in which a given donor is used two or more times for a given recipient, is necessarily accompanied by a reaction. Butsch and Ashby (8) report 26 cases in which the same donor was used twice for the same recipient, in 16 of which no reaction followed either transfusion, while in 7 only one transfusion was accompanied

by reaction, and in the remaining 3 a reaction followed both transfusions. Meleney, Stearns, Fortuine and Ferry (48), however, in a review of 280 transfusions, concluded that subsequent donation of blood by a given donor to a given recipient, tends to increase the frequency of reaction in direct proportion to the number of transfusions. Thus the percentage of reactions of various degrees in their series was as follows:

	Percentage
After the first transfusion	57
After the second transfusion	70
After the third transfusion	73
After the fourth transfusion	91

The latter authors, from a study of the same series of 280 transfusions, pointed out the interesting fact, that repeated transfusions, from several donors to a given recipient also tend to increase the frequency of reaction in this recipient. Reactions of various degrees occurred in the following percentages:

	Percentage
After the first transfusion	60
After the second transfusion	59
After the third transfusion	67
After the fourth transfusion	68
After more than four transfusions	74

McLure and Dunn (25), in an excellent analysis of 150 transfusions found that "in the patients for whom many transfusions have had to be done, it became more and more difficult to find donors whose blood would match that of the patient. A donor may match perfectly early in the series of transfusions and later be found unsuitable. . . . It is, therefore, most important that the bloods be matched before each transfusion." Several years later Bowcock corroborated these observations, and went even further by stating that "in certain cases of pernicious anæmia which have been repeatedly transfused, there comes a time when suitable donors are no longer to be found, and when this point is reached, no further attempt to transfuse these patients should be made."

All these observations together point to the definite phenomenon which must now be accepted as an incontestable fact, namely, that the original iso-hæmoagglutinin and iso-hæmolysin properties of the recipient's blood are altered as the result of the addition of donor's blood. What the nature of this alteration is, remains an open question—a problem for study.

There is a very close resemblance between the symptoms and signs of a reaction following a second transfusion from the same donor and the symptoms and signs of anaphylactic shock, as is very well illustrated by the four cases cited above. This fact has led all observers to suggest that the posttransfusion reaction may be anaphylactic, the first transfusion being held responsible for the causation of a hypersusceptibility of the recipient's serum against the donor's cells. This, however, does not make the explanation much clearer for the phenomenon of anaphylaxis is itself very inadequately understood, and explanations of its exact nature are as yet at the stage of hypotheses.

It is important to know whether the reaction is associated with any change in the group of the recipient. All those who do transfusions can contribute to the elucidation of this point by testing the recipient's blood before and after transfusion, by both the direct and the indirect methods. Recently, we found that after a donor had been used twice for the same recipient (although the recipient remained in the same group, Moss 11), her serum caused slight agglutination of the donor's cells, whereas in previously performed direct tests no agglutination was observed. We do not attach any great importance to this single observation, since a large series of data would be necessary to allow of any definite conclusion on this phase of the problem.

The investigations of Sellards and Minot (41) and of William Bayliss (1) eliminate the possibility that the presence of free hæmoglobin in the blood is the main cause of posttransfusion reactions.

The possible influence of a particular donor on the frequency of reactions in the patients to whom he gives blood was investigated by Meleney, Stearns, Fortuine and Ferry (48) in their series of six donors, each of whom was used twelve times or more. One man who donated blood sixteen times was associated with reactions in the recipients on fourteen occasions (88 per cent), while another who

gave fifteen transfusions caused only seven reactions (47 per cent). The largest number of donations made by one man was 36, and in his case there were 28 reactions (78 per cent). There is, therefore, considerable difference between donors in their tendency to produce reactions.

The relatively great frequency of milder degrees of posttransfusion reactions, consisting of a transitory rise in temperature, often associated with chills, tingling etc., and occasionally slight hæmoglobinuria, raises the question as to whether these reactions are only milder degrees of those severe ones which follow definite incompatibilities between donor's and recipient's bloods, or whether they are due to independent causes, as, for example, deficiencies in technique, influences of contact of donor's blood with foreign substances (Fenn, 14) during the operation, etc. From the investigations of Meleney (48) and his associates, of Drinker and Brittingham (13), and of Butsch and Ashby (8), it appears reasonable to include all reactions in one general category, as regards their causation.

It appears, therefore, that the most logical path of investigation into the exact cause of posttransfusion reactions lies within the broad field of immunology.

CONCLUSIONS

Although the exact nature of the reactions and their causes leave much room for study, the practical lessons to be learned from the above observations are quite definite and very valuable to the safe practice of transfusion:

1. The compatibility of the recipient's and donor's bloods must be determined prior to each and every transfusion.

2. No transfusion must be done during or within 24 hours after prolonged ether anæsthesia even when the donor has been found suitable previous to the beginning of anæsthesia.

3. Much depends upon the accuracy of the test. It is, therefore, preferable to do both the indirect test (Moss, 28) to determine the group of donor and recipient, and also the direct (Cooca, 9) test, to corroborate the compatibility of the bloods, thus checking up one test by the other.

In a very recent article Robertson and Rous (39) conclude that in cases of repeated transfusion it is necessary to test for autoagglutination in the recipient's blood, and also point out that serum separated at 37° C. contains more agglutinins than that separated at room temperature, whereas agglutination is more marked at room temperature than at 37° C.

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VOMITING AND DISTENTION AFTER LAPAROTOMY LESSENED BY THE SUBSTITUTION OF RUBBER ENVELOP PADS FOR GAUZE

Influence of Ether, Morphine, and Rectal Therapy

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THE primary object of this study was to find out what differences, if any, in postoperative emesis and intestinal distention existed between laparotomized cases in which rubber envelop pads were used and those in which gauze pads were used.

The operations were intra-abdominal and, with a few exceptions (namely, appendectomies, intestinal resections, and ventral herniæ), were performed upon the pelvic organs of the female. In many cases, plastic work of the vaginal canal was done in combination with the abdominal work. The character of the operations was, therefore, practically the same. Simple appendectomies, when done through the McBurney or right rectus incision, were not included for the reason that here little use was made of pads, and consequently but a limited amount of trauma was inflicted on the peritoneum of the intestines.

It was originally proposed to study 800 laparotomized cases. In 400 of these, rubber envelop pads were used; in 400, gauze pads were used. The former cases were operated on between November 26, 1917, and January 13, 1920, and the latter between December 20, 1917, and July 15, 1920. But after completing the study in greater part, it was discovered that of the three operators who were credited with the use of gauze pads, one not infrequently used rubber pads, and, as it could not be determined in which cases the gauze pads were used, it was necessary to eliminate 34, making a study of 366 cases in which gauze pads were used, and 400 in which rubber pads were used. As this study was made primarily to determine the difference in action and influence of rubber and gauze used intra-abdominally with respect to postoperative emesis and distention, it was necessary to exclude all cases of general septic peritonitis, as emesis and distention are almost invariable sequelæ to this pathology.

The study was limited to the first 3 days of convalescence, because cathartics, which are usually administered on the fourth day, are not infrequently responsible for emesis, and because distention from operative causes, unless the result of sepsis, seldom extends beyond the third day.

The operative technique of one group of cases differs radically from that of the other in one particular only, namely, in the character of the abdominal pads used.

The postoperative care differed in several minor features, namely in regard to rectal therapy and the degree of tension of the abdominal binder. Pre-operative care was practically the same in all cases with respect to the amount of morphine and atropine administered before etherization.

The group in which rubber envelop pads were used will be designated as group 2; the group in which gauze pads were used will be designated as group 3. As the comparative study will be made with regard to the days on which emesis or distention occurred, these groups will be divided according to days. Classified according to this plan, it was found that the cases fall into eight divisions:

The first division includes those cases which did not vomit at any time during the first 3 days of convalescence;

The second division includes those cases which vomited the first day only (that is, the day of operation);

The third division includes those cases which vomited the first and second days only;

The fourth division includes those cases which vomited during the first, second, and third days;

The fifth division includes those cases which vomited the first and third days only;

The sixth division includes those cases which vomited the second and third days only;

TABLE I.—GROUP 1. NON-LAPAROTOMIZED 300 CASES

Divisions	Emesis record Days of convalescence 1st	2nd	3rd	No. of cases in each division	Percentage in each division
1	o	o	o	80	26.7
2	x	o	o	208	69.3
3	x	x	o	5	1.7
4	x	x	x	3	1.0
5	x	o	x	1	.3
6	o	x	x	o	.0
7	o	x	o	2	.7
8	o	o	x	1	.3
Total				300	100.0

x Indicates the day or days on which one or more emesis occurred.

The seventh division includes those cases which vomited during the second day only;

The eighth division includes those cases which vomited during the third day only.

It was a simple matter to determine the frequency and duration of emesis in groups 2 and 3, but an analysis of them, with the object of determining why there were such great variations in emesis with respect to days, and of differentiating between emesis, the result of ether, and emesis, the result of other causes, was found impossible until the limits of the influence of ether, morphine, and other factors were known. Therefore, it became necessary to study another group of cases, those in which all causative factors arising from peritoneal invasion were eliminated. This group will be known as group 1, the non-laparotomized cases (Table I).

Of the 300 cases constituting group 1, 80, or 26.7 per cent, did not vomit during the first 3 days of convalescence; 208, or 69.3 per cent, vomited during the first day only, and 12, or 4 per cent, vomited during and after the first day or only after the first day.

To facilitate the study of group 1, I have divided it into subgroups *a* and *b*. Subgroup *a* consists of those cases which were under the influence of ether more than 1 hour (Table II). Subgroup *b* consists of those cases which were under the influence of ether less than 1 hour (Table III). The former includes 200 cases with extreme limits of time—1 hour to 3 hours 10 minutes; the latter includes 100 cases with extreme limits—15 minutes to 1 hour.

An analysis of subgroup *a* with respect to the time of etherization, and the time limit of postoperative emesis shows:

TABLE II.—SUBGROUP *a*. NON-LAPAROTOMIZED CASES; TIME OF OPERATION MORE THAN ONE HOUR; 200 CASES

Divisions	Emesis record Days of convalescence 1st	2nd	3rd	No. of cases in each division	Minutes	Percentage in each division
1	o	o	o	50	100	25.0
2	x	o	o	140	95	70.0
3	x	x	o	5	—	2.5
4	x	x	x	2	—	1.0
5	x	o	x	1	—	.5
6	o	x	x	o	103	.0
7	o	x	o	1	—	.5
8	o	o	x	1	—	.5
Total				200		100.0

x Indicates the day or days on which emesis occurred one or more times.

The average time of etherization in the 50 cases constituting division 1 was 1 hour, 40 minutes;

The average time of etherization in the 140 cases constituting division 2 was 1 hour 35 minutes;

The average time of etherization in the 10 cases constituting divisions 3, 4, 5, 6, 7, and 8 was 1 hour 43 minutes.

A further analysis shows that of the 50 cases constituting division 1, etherization lasted 2 hours or more in 12 cases with an average time of 2 hours, 24 minutes, and that in the remaining 38 cases of this division etherization lasted between 1 and 2 hours, with an average time of 1 hour, 22 minutes.

That of the 140 cases constituting division 2 etherization lasted 2 hours or more in 30 cases with an average time of 2 hours, 10 minutes, and that in the remaining 10 cases of this division etherization lasted between 1 and 2 hours with an average time of 1 hour, 24 minutes.

This analysis shows—

First, that the average time of etherization in the cases which did not vomit at any time was not shorter but 5 minutes longer than in the cases which did vomit during the first 24 hours only.

Second, that the average time in the 12 cases under ether 2 hours or more, which did not vomit, was 14 minutes longer than that of the 30 cases under ether 2 hours or more but which did vomit during the first 24 hours.

Third, that the average time of the remaining 38 cases etherized between 1 and 2 hours

TABLE III.—SUBGROUP *b*. NON-LAPAROTOMIZED CASES; TIME OF OPERATION LESS THAN ONE HOUR; 100 CASES

Divisions	Emesis record Days of convalescence 1st	2nd	3rd	No. of cases in each division	Minutes	Percentage in each division
1	o	o	o	30	27	30.0
2	x	o	o	68	30	68.0
3	x	x	o	o	—	o
4	x	x	x	1	—	1.0
5	x	o	x	o	—	o
6	o	x	x	o	22	o
7	o	x	o	1	—	1.0
8	o	o	x	o	—	o
Total				100		100.0

x Indicates the day or days on which one or more emesis occurred.

which did not vomit was 2 minutes less than that of the 10 cases etherized between the same hours but which did vomit.

As there are only 10 cases in the remaining divisions which vomited irregularly with regard to days, it is difficult to make a satisfactory comparative study of them. We find, however, that the emesis which occurred in these cases after the first day, was the result, in the majority of cases, of such causes as food and medicine administered immediately before emesis.

Two of these cases, therefore, might be classified in division 1; eight of them might be classified in division 2. Under this readjustment the average time of division 1 would be 1 hour 37 minutes, and that of division 2, 1 hour 36 minutes.

These findings would suggest that the element of time as a causative factor in postoperative emesis is not so important as we have heretofore been led to believe.

An analysis of subgroup *b* with respect to the time of etherization, and the time limit of postoperative emesis shows:

The average time of etherization in the 30 cases constituting division 1 was 27 minutes;

The average time of etherization in the 68 cases constituting division 2 was 30 minutes;

The average time of the remaining 2 cases constituting divisions 4 and 7 was 22 minutes.

A further analysis shows—

That of the 30 cases which constituted division 1, etherization lasted from 30 to 55 minutes in 13 cases, with an average time of 39 minutes, and that in the remaining 17 cases

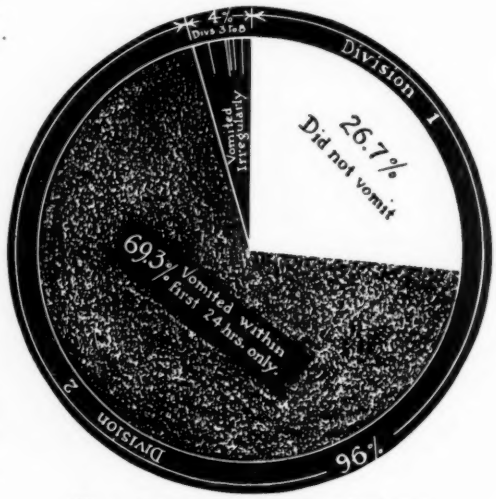

Fig. 1. Group 1. Non-laparotomized cases.

of this division etherization lasted less than 30 minutes;

That of the 68 cases which constitute division 2 etherization lasted, in 38 cases, from 30 to 57 minutes, with an average time of 37 minutes. In the remaining 30 cases of this division, etherization lasted less than 30 minutes, with an average time of 20 minutes.

This analysis shows—

First, that the average time of etherization, in the cases which did not vomit at any time, was 3 minutes shorter than that in the cases which did vomit during the first day.

Second, that the average time in the 13 cases under ether between 30 and 55 minutes, which did not vomit, was 2 minutes longer than that in the 38 cases under ether the same length of time but which did vomit during the first day.

Third, that the average time of the remaining 17 cases etherized less than the 30 minutes, which did not vomit, was only 1 minute less than that of the 30 cases etherized the same length of time but which did vomit during the first day.

Of the two cases which vomited irregularly with regard to days, one vomited on each of the 3 days and was etherized 30 minutes. The other vomited on the second day only and was etherized 15 minutes. Accidental

causes were determined immediately preceding the emesis which occurred in these cases on the second and third days. The first case might, therefore, be classified with division 2, and the second case with division 1; but as these cases constitute so small a part of the entire group and, as the length of their respective etherization could alter but little the percentage of the divisions, they might be disregarded entirely.

It would, therefore, seem that regarding the relationship between the duration of etherization and frequency or infrequency of emesis, there is no fixed rule.

TO WHAT EXTENT DOES MORPHINE ADMINISTERED HYPODERMATICALLY AFTER OPERATION ENTER AS A CAUSATIVE FACTOR IN POSTOPERATIVE EMESIS?

An analysis of the divisions in group 1—non-laparotomized cases—shows the following:

Of the 80 cases with no vomiting, we find that 40 received morphine during the first day; as no emesis occurred on this day, these 40 cases which received morphine acted, with respect to emesis, as did the remaining 40 cases which did not receive morphine. The total amount of morphine given these 40 cases was a fraction less than 16 grains or an average of 0.4 of a grain.

On the second day, we find that 26 cases received morphine. As no emesis occurred on this day, the 26 cases which received morphine acted in no way differently with respect to emesis than did the remaining 53 cases which received no morphine. The total amount of morphine given these 26 cases was a fraction less than 8 grains or an average of 0.3 of a grain.

On the third day, we find that 10 patients received morphine. As no emesis occurred on this day, these 10 patients acted, with respect to emesis, as did the remaining 69 cases in which no morphine was administered. The total amount of morphine given these 10 patients was 3 grains or an average of 0.3 of a grain.

Of the 208 cases vomiting on day of operation (division 2), we find that 134 cases received morphine during the first day. As emesis occurred on the first day in all cases of this division, the remaining 74 cases vomited independently of the possible influence of morphine acting as a causative factor in emesis. Of the 134 cases which received morphine, 53 vomited before its administration, 49 vomited after, and 32 vomited before and after. The total amount of morphine given these 134 cases was 52 grains or an average of 0.4 of a grain.

On the second day, we find that 79 patients received morphine. As no emesis occurred on the second day of this division, these 79 cases which received morphine acted in no way differently, with respect to emesis, than did the remaining 129 cases which received no morphine. The total amount of morphine administered to these 79 cases was 29 grains or an average of 0.3 of a grain.

On the third day, we find that 40 patients received morphine. As no emesis occurred on the third day of this division, these 40 cases acted in no way differently, with respect to emesis, than did the remaining 168 cases which received no morphine. The total amount of morphine administered to the 40 cases was 11 grains or an average of 0.3 of a grain.

It would, therefore, appear from this analysis that of the 174 cases not vomiting at all or vomiting the first day only (divisions 1 and 2), which received morphine during the first day, only those cases which vomited after its administration, namely 49, and those cases which vomited before and after, namely 32, totaling 81, could have been influenced by morphine with respect to emesis.

As the average amount of morphine (i.e., 0.4 of a grain) administered to these 81 cases which vomited was no greater, but identical, to the average amount given to the 93 cases which did vomit, and as the average amount (i.e., 0.3 of a grain) administered on the second day to the 105 cases and on the third day to the 50 cases were identical, it would seem reasonable to conclude that the amount of morphine administered hypodermatically after operation exerted but a minor influence, if any, as a factor in postoperative emesis.

Of the 12 cases, constituting 5 of the remaining 6 divisions, we find that 9 cases received morphine during the first day and three did

not. Of the 9 cases, 8 vomited on that day and 1 did not. Of the 8 cases, 2 vomited after, and 6 vomited before and after, the administration of morphine. The case which did not vomit received a larger dose of morphine during the first day than did any of the cases which vomited. The total amount of morphine given the 8 cases which vomited was 4 grains or an average of 0.4 of a grain. Of the 3 cases which received no morphine on the first day, 1 vomited seven times, and 2 did not vomit.

Of the 7 cases which received morphine on the second day, we find that 5 vomited and 2 did not. Of the 5 cases which vomited, the cause of emesis in 4 could be traced to food or medicine administered by mouth. To the remaining 2 cases which did not vomit, the smallest individual amount of morphine was administered. Of these cases, 1 received the largest individual amount of morphine administered on the second day to any of the 12 cases constituting 5 of the remaining 6 divisions. The total amount of morphine administered to the 7 cases was 1.7 grain or an average of ¼ grain.

On the third day, we find that 3 cases received morphine. Of these only 1 vomited. This is the case previously noted as having received the largest amount of morphine on each of the first 2 days without emesis following. But on this, the third day, it received the smallest amount of morphine administered during the 3 days. There is every reason to believe, however, that emesis did not occur then as the result of morphine but as the result of the administration of magnesium sulphate which it immediately followed.

It would therefore seem that, regarding the relationship between the amount of morphine administered and the frequency or infrequency of emesis, there is no fixed rule.

While a very considerable number of individual cases could be related to sustain both conclusions formed by the previous study of averages regarding the relationship between ether and emesis, and morphine and emesis, it has been deemed undesirable to include these as in the study of individual cases, idiosyncrasy to drugs, which is an indeterminable factor, must enter.

IS THERE A FIXED RELATIONSHIP BETWEEN THE AMOUNT OF ETHER AND THE TIME OF ITS ADMINISTRATION?

It is to be regretted that the amounts of ether administered to the cases in group 1—non-laparotomized cases—were not sufficiently often recorded to permit of an exact estimate of the average amount administered per hour.

In subgroup *a*, those over 1 hour, there were 93 cases recorded with an average amount per hour of 176 cubic centimeters; in subgroup *b*, those under 1 hour, there were only 15 cases with amount of ether recorded, averaging per half hour 135 cubic centimeters. This comparison would make it appear that the average amount of ether administered is greater during a short anæsthesia than during a long one.

There was noted in the hands of only one anæsthetist a somewhat constant relationship between the two elements—the amount of ether and time of administration—but in this instance the number of cases was too few to be of value in forming a conclusion.

TIME LIMIT OF POSTOPERATIVE EMESIS AND THE LIMIT OF THE INFLUENCE OF ETHER WITH RESPECT TO EMESIS

Our immediate concern in this last analysis of group 1—non-laparotomized cases—is in regard to the limit of postoperative emesis and the predominant causative factor of emesis. As peritoneal trauma is not present in this group, it offers the best opportunity to study the limit of influence of any element, common to all groups, which might enter in causative relationship to emesis.

Such causative factors of emesis as food and medicine administered by mouth, acidosis, gastric accumulations, etc., act occasionally and may be considered accidental, but ether in the blood is the only possible factor which may be considered as constant.

Though ether as a possible factor is constant, one or more of the accidental factors may at times act independently or with it; therefore, it is not always possible to determine when emesis is the result of a single factor. A fairly accurate conclusion may, however, be arrived at in determining the predominating causative element of emesis in

this group by an analysis of the duration of emesis with respect to hours and a study of immediate or accidental causes.

If in a very large percentage of cases, the limit of postoperative emesis should fall within a period during which certain accidental factors are not usually present, this fact would be suggestive of the predominating influence of the factor known to be constant.

An analysis of group 1—non-laparotomized cases—shows that 80 cases, or 26.7 per cent, were not influenced with respect to emesis by any probable causative factor; that in 208 cases, or 69.3 per cent, emesis occurred during the first 24 hours only, and that in but 12 cases, or 4 per cent, did emesis occur after the first 24 hours.

In the 208 cases which vomited during the first day only, there doubtless existed more than one causative factor of emesis, but whatever they were and how many there may have been, their limit of influence did not exceed 24 hours. However, of the possible factors, ether alone was constant; therefore, it would seem reasonable to consider it the dominant factor in the causation of emesis during this period. Further, that, as the limit of emesis in these 208 cases did not exceed 24 hours, we may reasonably suppose that the limit of the influence of ether with respect to emesis does not exceed the first 24 hours.

Of the 12 cases in which emesis occurred after the first day, accidental causes, such as food and medicine by mouth, were discovered on the second and third day in 9; in the remaining 3 cases no immediate or accidental cause of emesis was determined. Of the 9 cases, 2 did not vomit on the first day, and 7 did. Because of the fact that accidental causes of emesis were determined after the first day in these cases, the former might be included in division 1 and the latter in division 2. If so considered, the total number of cases which vomited during the first day only, and from other than known accidental causes, would increase from 208, or 69.3 per cent, to 217, or 72.3 per cent. In the remaining 3 cases in which no accidental cause was discovered to account for emesis occurring after the first 24 hours, the limits of emesis were as follows: first case, 26 hours after operation; second case, 30 hours after operation; and the third case, 39 hours after operation. The emesis which occurred 39 hours after operation in the third case was the only emesis which occurred in this case during the entire time of convalescence.[1]

TABLE IV.—RATING OF ANÆSTHETISTS

Anæsthetists	Number of cases	Percentage of cases which did not vomit	Percentage of cases which did vomit
No. 1	18	66.6	33.4
No. 2	23	47.8	52.2
No. 3	16	44.0	56.0
No. 4	55	36.4	63.6
No. 5	79	29.0	71.0
No. 6	54	23.8	76.2
No. 7	36	14.0	86.0

A list showing the rating of the anæsthetists who administered ether more than 10 times is given in Table IV.

Anæsthetists' numbers 1, 2, and 3, though showing a comparatively high percentage of cases which did not vomit, had fewer cases by less than half than numbers 4, 5, and 6.

One of the group, namely, number 7, showed a much higher percentage of cases vomiting than the others. This single instance raises the question regarding the individual skill of the anæsthetist as a factor in limiting emesis, but the rating of no anæsthetist can be determined under 50 or 100 cases.

Ether was administered to the remaining 19 cases by 6 other anæsthetists.

CONCLUSIONS REGARDING NON-LAPAROTOMIZED CASES

1. In 300 successive non-laparotomized cases, etherized, over 26 per cent escaped vomiting altogether; nearly 70 per cent vomited only in the first 24 hours, and 4 per cent vomited irregularly.

2. The length of etherization has no relationship to postoperative emesis with respect to frequency or days of occurrence.

3. The influence of morphine administered hypodermatically after operation is, with respect to emesis, practically nil.

4. The dominating fact in the causation of emesis when the peritoneum of the intestines

[1] If it be held that these three cases should be considered in arriving at a conclusion regarding the influence of ether in producing emesis, then it would be necessary to extend the limit of ether emesis to 39 hours; but all things considered, it would seem justifiable to classify these cases as exceptions to the rule, i.e., that ether emesis does not exceed 24 hours.

Fig. 2. Group 2. Cases in which rubber envelop pads were used.

Fig. 3. Group 3. Cases in which gauze pads were used.

TABLE V.—GROUP 2. LAPAROTOMY WITH RUBBER ENVELOP PADS; 400 CASES

Divisions	Emesis record Days of convalescence 1st	2nd	3rd	No. of cases in each division	Percentage in each division
1	o	o	o	108	27.0
2	x	o	o	179	44.7
3	x	x	o	50	12.5
4	x	x	x	29	7.3
5	x	o	x	14	3.5
6	o	x	x	6	1.5
7	o	x	o	10	2.5
8	o	o	x	4	1.0
Total				400	100.0

x Indicates the day or days on which one or more emesis occurred.

TABLE VI.—GROUP 3. LAPAROTOMIZED CASES WITH GAUZE; 366 CASES

Divisions	Emesis record Days of convalescence 1st	2nd	3rd	No. of cases in each division	Percentage in each division
1	o	o	o	46	12.6
2	x	o	o	148	40.5
3	x	x	o	71	19.4
4	x	x	x	65	17.7
5	x	o	x	19	5.2
6	o	x	x	5	1.4
7	o	x	o	6	1.6
8	o	o	x	6	1.6
Total				366	100.0

x Indicates the day or days on which one or more emesis occurred.

is not traumatized is ether and the limit of its influence is 24 hours.

A Comparative Study of the 400 Laparotomized Cases (Group 2) in Which Rubber Envelop Pads Were Used and the 366 Laparotomized Cases (Group 3) in Which Gauze Was Used

Emesis during first three days

An analysis of laparatomized cases in which rubber envelop pads were used—group 2—shows the following:

Of the 400 cases constituting group 2, 108 cases, or 27 per cent, did not vomit during the first 3 days of convalescence; 179 cases, or 44.7 per cent, vomited during the first day only; 50 cases, or 12.5 per cent, vomited during the first and second days only; 29 cases, or 7.3 per cent, vomited on each of the 3 days; 14 cases, or 3.5 per cent, vomited on the second and third days only; 10 cases, or 2.5 per cent, vomited on the second day only; and 4 cases, or 1 per cent, vomited on the third day only.

An analysis of laparotomized cases in which gauze was used—Group 3—shows the following:

Of the 366 cases of group 3, 46 cases, or 12.6 per cent, did not vomit during the first 3 days of convalescence; 148 cases, or 40.5 per cent, vomited during the first day only; 71 cases,

Fig. 4. Group 2. Four hundred cases of which 386 cases, or 96.5 per cent, did not distend; 14, or 3.5 per cent, did distend.

Fig. 5. Group 3. Three hundred sixty-six cases of which 319, or 87 per cent, did not distend and 47, or 13 per cent, did distend.

or 19.4 per cent, vomited during the first 2 days only; 65 cases, or 17.7 per cent, vomited on each of the 3 days; 19 cases, or 5.2 per cent, vomited on the first and third days only; 5 cases, or 1.4 per cent, vomited on the second and third days only; 6 cases, or 1.6 per cent, vomited on the second day only and 6 cases, or 1.6 per cent, vomited on the third day only.

INTESTINAL DISTENTION

A comparative study of the two groups shows that in group 2, some form of distention occurred in 16 cases. Of these, 4 were recorded as "distended" and 12 as "slightly distended." As 2 were recorded as "gastric distention" the number of cases of intestinal distention in this group was 14, or 3.5 per cent. Three cases distended on 2 successive days; no case distended on 3 successive days.

In group 3, there were 47 cases recorded as having had some form of distention; 33 of these were recorded as "distended" or "considerably distended" and 14 as "slightly distended." No cases were recorded with "gastric distention." Therefore, the number of cases with intestinal distention in this group was 47, or 13 per cent. Seven cases distended on 2 successive days, and 1 case distended on 3 successive days.

It may be of interest to note the difference of distention occurring in the corresponding divisions of the two groups as shown in table.

TABLE VII.—DIFFERENCE OF DISTENTION

Group 2		Group 3	
Division	Percentage	Division	Percentage
1	3.6	1	8.7
2	2.8	2	8.7
3	8.0	3	15.5
4	10.3	4	20.1
5	0	5	5.0
6	0	6	40.0
7	0	7	33.0
8	0	8	16.0

Our interest centers in the comparative difference in the 4 first divisions of the 2 groups, as the last 4 divisions constitute only 8 or 9 per cent of their respective groups, and are too small to influence materially conclusions drawn from the first 4 divisions; but as a matter of information, it might be noted that in the 4 last divisions of group 2, no distention occurred as contrasted with 16.6 per cent in the corresponding divisions of group 3.

It will be noted that there is a marked increase in percentage between divisions 2 and 3, and 3 and 4 of each group and an equally

striking contrast of difference in divisions 3 and 4 of group 2 and the corresponding divisions of group 3. The increase in percentage between the second divisions of each group corresponds with the increase in the duration of emesis in each respective division, namely two successive days of emesis in division 3 and 3 successive days of emesis in division 4. Also the difference in percentage in the same divisions of the two groups is equally striking and shows that some influence, causative of both emesis and distention, occurred to a greater degree in one group than in the other.

Our previous analysis of group 1 showed that such a difference could not be attributed to the length of time ether was administered, to the amount of morphine, or to the character of operation. To what then can such a difference be due?

The only factor common to both groups 2 and 3 and not found in group 1, which might be considered as causative of both emesis and distention, is peritoneal trauma; but in division 3 of group 2, we find distention in 8 per cent of cases as compared to 15.5 per cent in the corresponding division in group 3, and 12.5 per cent emesis in the division 3 of group 2 as compared to 19.4 per cent in the corresponding division of group 3. In division 4 of group 2, we find distention in 10.3 per cent of cases as compared to 20.1 per cent in the corresponding division of group 3 and 7.3 per cent emesis in division 4 of group 2, as compared to 17.7 per cent in the corresponding division of group 3.

This analysis shows that the common causative factor, which prolonged the time or duration of emesis and increased the percentage of distention, influenced both groups, but this is true to a lesser degree in one group than in the other, leading us to the conclusion that, as in divisions 3 and 4 in group 2, we have a markedly lessened per entage in both emesis and distention than in group 3; and as in group 2, the procedure adopted to keep the intestines out of the pelvis was less traumatizing than that used in group 3, a lesser degree of intestinal peritoneal trauma occurred, resulting in less emesis and distention in group 2 than in group 3.

MORPHINE

A comparative study with respect to morphine shows that in group 2 there were 17 patients who received no morphine during the first, second, and third days of convalescence. These were classified with respect to operations as shown in Table VIII.

TABLE VIII.—NO MORPHINE GIVEN IN FIRST THREE DAYS; GROUP 2

Retroversion	5
Supravaginal hysterectomy	5
Adnexal operations	3
Myomectomy	1
Exploratory	1
Separation of adhesions	1
Resection of ileum	1
Total	17, or 4.2 per cent

In group 3, there were 9 patients who received no morphine during the first 3 days of convalescence. These were classified with respect to operations as follows in Table IX.

TABLE IX.—NO MORPHINE GIVEN IN FIRST THREE DAYS; GROUP 3

Retroversions	2
Supravaginal hysterectomy	2
Appendix	1
Exploratory	2
Myomectomy	2
Total	9, or 2.4 per cent

It will be seen that practically 50 per cent more of cases received no morphine on the first 3 days of convalescence in group 2 than in group 3.

The total amount of morphine used in group 2 was 330 grains, or an average of 0.82 grain during the first 3 days of convalescence.

The total amount of morphine used in group 3 was 347 grains or an average of 0.95 grain during the first 3 days of convalescence.

These analyses show that in group 2 not only did a much greater number of individual cases pass through the first 3 days of convalescence without receiving morphine than in group 3, but that each day there were many more cases in group 2 than in group 3 which received no morphine, also that the total number of grains used in the 400 cases of group 2 were considerably less, i.e. 17, than the total number of grains used in the 366 cases of group 3.

In the first 4 divisions of each group, the average amount of morphine administered

TABLE X.—COMPARISON OF RESULTS WHERE MORPHINE IS USED AND WHERE IT IS NOT

AMOUNT OF MORPHINE ADMINISTERED ON THE INDIVIDUAL DAYS

	Group 2		
1st day	168 grs.	average	.42 gr.
2nd day	118 grs.	average	.29 gr.
3rd day	44 grs.	average	.11 gr.
	Group 3		
1st day	190 grs.	average	.52 gr.
2nd day	109 grs.	average	.30 gr.
3rd day	48 grs.	average	.13 gr.

CASES RECEIVING NO MORPHINE ON THE INDIVIDUAL DAYS

	Group 2		
1st day	28 cases	or	7 per cent
2nd day	96 cases	or	24 per cent
3rd day	257 cases	or	64 per cent
	Group 3		
1st day	11 cases	or	3 per cent
2nd day	64 cases	or	17 per cent
3rd day	176 cases	or	47 per cent

was greater in division 4 than in the other divisions. The question may arise as to whether the extended duration of emesis in this division (namely emesis on each of the 3 days) was the result of a larger average amount of morphine administered in this division than was administered in the other divisions. But it will be remembered that it was established by the analysis of group 1 that morphine *per se* (postoperative) does not occasion emesis.

It is, therefore, evident that the increased amount of morphine administered was due to an increase in amount and extent of pain. This increase in the amount of pain in the laparotomized groups was the result of an element not found in the non-laparotomized, i.e., peritoneal trauma; and it is presumably this element that not only increased the amount of pain, but extended the duration of emesis.

The Influence of Rectal Therapy on Postoperative Emesis; Its Comparative Use in Groups 2 and 3

Saline, bicarbonate of soda, glucose solutions, and hot water administered per rectum immediately before the termination of operation

When saline, bicarbonate of soda, glucose, or hot water is administered *per rectum* immediately before the termination of an abdominal section, what influence, if any, have they in lessening or preventing postoperative emesis?

In group 2 no rectal therapy was used immediately before the termination of operation.

In group 3 there were 212 cases, or 58 per cent, in which some form of rectal therapy was used immediately before the completion of operation.

The solutions were administered as follows:

	Cases
Saline solution	49
Bicarbonate of soda	103
Glucose, 5 per cent solution	8
Hot water	52

When the comparative records of groups 2 and 3, with respect to emesis, are recalled, the above analysis brings into serious question the efficacy of rectal therapy, if it does not conclusively prove that the effect of such therapy with regard to preventing or modifying postoperative emesis is nil.

Saline, bicarbonate of soda, and glucose solution administered per rectum in the form of "drips" after operation (Murphy and Harris)

The same question may be asked regarding the influence of these solutions upon postoperative emesis in the form of "drips" as was asked regarding the administration of these solutions in quantity *per rectum* immediately before the termination of the operation.

In group 2, we find that the Murphy drip was used in 2 cases and the Harris drip in 5 cases: total 7 cases, or 1.7 per cent; in 1 of these 7 cases the "drip" was used 2 days successively, or 0.2 per cent.

In group 3, we find that the Murphy drip was used in 68 cases and the Harris drip in 13 cases: total 81 cases, or 22.1 per cent; in 23 of these cases the "drip" was used 2 days successively and in 9 cases 3 days successively, or a total of 8.7 per cent of cases in which the "drip" was used in successive days.

This analysis would lead us to practically the same conclusion as previously reached regarding the relationship of emesis to rectal therapy when used at the termination of operation; but whatever influence postoperative rectal therapy in the form of "drips"

may exert in preventing emesis, it is entirely the result of its action in stimulating peristalsis, thereby lessening intestinal distention, to which emesis at times is due.

TIME OF ETHERIZATION AND ITS RELATION TO POSTOPERATIVE EMESIS

A study of the laparotomized groups 2 and 3 with respect to the relationship between time of etherization and postoperative emesis cannot be made with the same satisfaction as the non-laparotomized group (group 1), because of the introduction in the laparotomized groups of the element of peritoneal trauma.

However, a study of the first four divisions of groups 2 and 3 (divisions which constitute collectively 91.5 per cent and 90.2 per cent of their respective groups) corroborate the finding in the study of group 1 with respect to the relationship between the time of etherization and the duration of postoperative emesis—namely that the element of time *per se*, has little or no influence as a factor in extending the duration of postoperative emesis.

It is self-evident that the influence of time in division 1 of groups 2 and 3 could have had no possible bearing upon the question of emesis in this division, as no emesis occurred in this division of either group.

In comparing division 2 of groups 2 and 3, we find that there is a difference of only 1.1 per cent of cases which were etherized two or more hours and a difference of only 1 per cent of cases which were etherized less than 2 hours.

The difference in percentage is here so little and the difference in percentage with respect to emesis is so small, namely 4 per cent, that this division may be left out of consideration in our analysis.

In division 3 of group 2, we find that there was 36.9 per cent of cases which were anæsthetized 2 hours or more as compared to 18.3 per cent in the corresponding division of group 3; and in division 4 of group 2, we find that there was 41.3 per cent of cases which were anæsthetized 2 hours or more as compared to 24.6 per cent in the corresponding division of group 3.

Here it will be seen that though the percentage of cases, which were under ether 2 hours or more in divisions 3 and 4 of group 3, was smaller than in the corresponding division of group 2, yet the percentage of postoperative vomiting respecting days in these divisions of this group was larger than in the corresponding divisions of group 2, i.e., 12.5 per cent as compared to 19.4 per cent and 7.3 per cent as compared to 17.7 per cent.

In division 3 of group 2 we find that there was 63.1 per cent of cases which were anæsthetized between 1 and 2 hours as compared to 81.7 per cent in the corresponding division of group 3; and in division 4 of group 2 we find that there was 58.7 per cent of cases which were anæsthetized between 1 and 2 hours as compared to 75.6 per cent in the corresponding division of group 3.

Here it will be seen that though the percentage of cases which were under ether between 1 and 2 hours of divisions 3 and 4 of

TABLE XI.—TIME OF ETHERIZATION IN THE FIRST FOUR DIVISIONS OF GROUPS 2 AND 3

DIVISION 1	
Group 2—108 Cases	
Two hours and over	23.9 per cent of cases
Less than 2 hours	76.1 per cent of cases
Group 3—46 Cases	
Two hours and over	28.0 per cent of cases
Less than 2 hours	72.0 per cent of cases
DIVISION 2	
Group 2—179 Cases	
Two hours and over	28.7 per cent of cases
Less than 2 hours	71.3 per cent of cases
Group 3—148 Cases	
Two hours and over	27.7 per cent of cases
Less than 2 hours	72.3 per cent of cases
DIVISION 3	
Group 2—50 Cases	
Two hours and over	36.9 per cent of cases
Less than 2 hours	63.1 per cent of cases
Group 3—71 Cases	
Two hours and over	18.3 per cent of cases
Less than 2 hours	71.7 per cent of cases
DIVISION 4	
Group 2—29 Cases	
Two hours and over	41.3 per cent of cases
Less than 2 hours	58.7 per cent of cases
Group 3—65 Cases	
Two hours and over	24.6 per cent of cases
Less than 2 hours	75.6 per cent of cases

TABLE XII

DIVISION 1

Group 2

Supravaginal hysterectomy	35
Panhysterectomy	3
Retroversion	26
Adnexal and appendiceal	38
Resection of intestines	3
Exploratory	2
Myomectomy	1
	108

Group 3

Supravaginal hysterectomy	17
Panhysterectomy	8
Retroversion	16
Adnexal and appendiceal	3
Myomectomy	2
	46

DIVISION 2

Group 2

Supravaginal hysterectomy	51
Panhysterectomy	10
Retroversion	57
Adnexal and appendiceal	50
Exploratory	2
Myomectomy	5
Ventral hernia	4
	179

Group 3

Supravaginal hysterectomy	46
Panhysterectomy	15
Retroversion	53
Adnexal and appendiceal	26
Exploratory	3
Myomectomy	4
Ventral hernia	1
	148

DIVISION 3

Group 2

Supravaginal hysterectomy	13
Panhysterectomy	0
Retroversion	16
Adnexal and appendiceal	19
Myomectomy	1
Umbilical hernia	1
	50

Group 3

Supravaginal hysterectomy	11
Panhysterectomy	9
Retroversion	25
Adnexal and appendiceal	20
Myomectomy	4
Exploratory	2
	71

DIVISION 4

Group 2

Supravaginal hysterectomy	8
Panhysterectomy	0
Retroversion	8
Adnexal and appendiceal	8
Myomectomy	5
	29

Group 3

Supravaginal hysterectomy	12
Panhysterectomy	11
Retroversion	22
Adnexal and appendiceal	15
Myomectomy	4
Hernia	1
	65

group 3 was larger than in the corresponding divisions of group 2, yet the percentage of vomiting respecting days in these divisions of group 3 was greater than in the corresponding divisions of group 2, as has just been noted.

TABLE XIII.—COMPARATIVE STUDY OF OPERATORS, ANÆSTHETISTS, ETC.

Operators	
In group 2—rubber pad	In group 3—gauze pad
No. 1 did 62 per cent of entire work	No. 1 did 70 per cent of entire work
No. 2 did 32 per cent of entire work	No. 2 did 30 per cent of entire work
No. 3 did 6 per cent of entire work	
Anæsthetists	
Resident did 92.75 per cent of entire work.	Resident did 78.7 per cent of entire work
Special did 3.75 per cent of entire work	Special did 20.76 per cent of entire work
Not recorded, 3.5 per cent of entire work	Not recorded, 0.54 per cent of entire work
Peritoneal adhesions	
In 38.5 per cent	In 24.6 per cent
Abdominal and vaginal drainage	
In 8.0 per cent	In 2 per cent
Incision	
Longitudinal in 80 per cent	Longitudinal in 99.7 per cent
Transverse in 20 per cent	Transverse in 0.3 per cent
Union	
Primary in 98 per cent	Primary in 97.5 per cent
Secondary in 2 per cent	Secondary in 2.5 per cent
Age	
45 years or over, 14.2 per cent	45 years or over, 9.9 per cent
Under 45 years, 70.6 per cent	Under 45 years, 65.2 per cent
Not recorded, 15.2 per cent	Not recorded, 24.9 per cent
Private and ward cases	
Ward—73.5 per cent	Ward—80 per cent
Private—26.5 per cent	Private—20 per cent
Glucose intravenously	
None administered	First day 300 c.cm. in 3 cases Div. 2: 300 c.cm. in 1 case Second day 500 c.cm. in 1 case Div. 3 400 c.cm. in 1 case
Saline intravenously	
None administered	First day, 750 c.cm. 1 case c.cm. 1 case 100 c.cm. 1 case

That is in divisions 3 and 4 of group 2 there was a greater percentage of cases which were etherized 2 hours or more with a less percentage of postoperative vomiting respecting days than in the corresponding division of group 3; while in divisions 3 and 4 of group 3 there was a greater percentage of cases etherized less than 2 hours with a greater percentage of postoperative emesis than in the corresponding divisions of group 2.

A STUDY OF THE CHARACTER OF OPERATION IN THE TWO GROUPS WITH RESPECT TO THEIR INFLUENCE UPON EMESIS

As it might be argued that the character of operation influences postoperative results with respect to emesis, it will be necessary to compare the character and number of operations in the different divisions of the two groups. As the first four divisions of groups 2 and 3 constitute 91.5 per cent and 90.2 per cent of their respective groups, they are

sufficient in number and percentage to determine the point in question.

A review of Table XII will convince one that all operations, except panhysterectomy, are in fair proportion, represented in the several divisions of the two groups. It is generally conceded that panhysterectomy is a grave operation and frequently followed by stormy convalescence, yet in divisions 1 and 2 of group 2 (divisions in which emesis when occurring did not exceed 24 hours) there is 4.5 per cent of panhysterectomies as compared to nothing in the divisions in which vomiting extended to the second or third days, namely divisions 3 and 4. In the same divisions in group 3 there was 11.7 per cent as compared to 14.6 per cent. This table furnishes sufficient evidence, it would seem to show, that neither the character nor the gravity of the operation influences necessarily postoperative results regarding emesis.

CONCLUSIONS REGARDING LAPAROTOMIZED CASES

1. In 400 successive laparatomized patients, the use of rubber envelop pads resulted in freedom from vomiting in practically the same proportion as in the non-laparotomized patients.

2. Comparing nearly equal numbers of laparotomized cases under approximately the same conditions, this study demonstrates that to substitute the rubber envelop pads for gauze pads is to double the chance of escaping vomiting; to reduce 2 days vomiting by one-third; to cut 3 days vomiting 60 per cent; and to lessen distention by two-thirds.

3. The dominant factors in the causation of emesis in laparotomized cases are ether and trauma of the peritoneum of the intestines and while the influence of ether is only 24 hours, the influence of intestinal peritoneal trauma may extend to 3 days or more.

4. Less vomiting, less distention and less morphine shows less trauma to the peritoneum.

DESCRIPTION OF DIAGRAMS OF COMPARATIVE PERCENTAGES OF EMESIS IN THE THREE GROUPS

In the diagrams (Figs. 1 to 5), division 1 of each group, the division in which no vomiting occurred, is designated by white. Division 2 of each group, the division in which vomiting occurred on the first day only, is designated in gray; and the remaining 6 divisions are designated by black.

Comparing the divisions of group 2 (the group in which rubber envelop pads were used) with the divisions of group 1 (the non-laparotomized group) and with group 3 (in which gauze was used), we find that 27 per cent of group 2 division 1 did not vomit as compared to 26.7 per cent of group 1 (division 1) and 12.6 per cent of group 3 (division 1); therefore the number of laparotomized cases which did not vomit when rubber envelop pads were used was practically the same as did not vomit in the non-laparotomized work, but more than twice as many as did not vomit in the laparotomized group in which gauze was used.

We find that 44.7 per cent of group 2 (division 2) vomited on the first day only as compared to 69.3 per cent of group 1 (division 2) and 40.5 per cent of group 3 (division 2), therefore the number of cases of group 2 which vomited on the first day only is about one-third less than those of group 1, and a little more than those of group 3.

The most striking contrast in the 6 remaining divisions of the two laparotomized groups (groups 2 and 3) is in division 3 in which vomiting occurred on the first and second days only, and division 4 in which vomiting occurred on the first, second and third days. Here we find that when rubber envelop pads were used, 12.5 per cent vomited on the first and second days only as compared to 19.4 per cent when gauze was used; and that only 7.3 per cent vomited on the first, second and third days when the rubber envelop pads were used as compared to 17.7 per cent when gauze pads were used.

When the first 2 divisions of the three groups are considered collectively and contrasted with the remaining 6 divisions of their respective groups we find that—

First, the divisions 1 and 2 of group 1, divisions in which vomiting either did not occur or occurred only during the first day, constitute 96 per cent of the entire group as contrasted with 4 per cent of the remaining 6

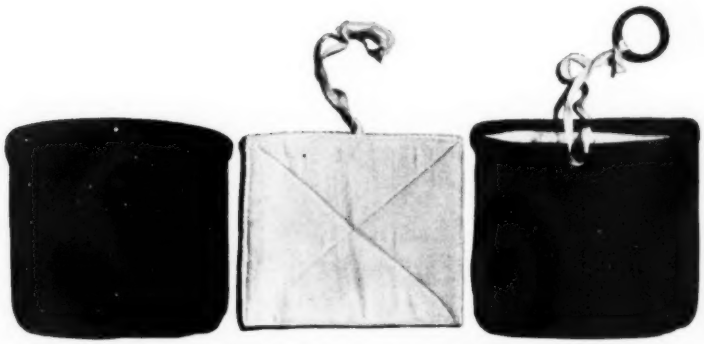

Fig. 6. Photograph showing rubber envelop, towel pad, and pad complete.

divisions in which vomiting occurred on and after the first day or only after the first day.

Second, divisions 1 and 2 of group 2, divisions in which vomiting either did not occur or occurred only during the first day, constitutes 71.7 per cent of the entire group as contrasted with 28.3 per cent of the remaining 6 divisions in which vomiting occurred on and after the first day or only after the first day.

Third, divisions 1 and 2 of group 3, divisions in which vomiting did not occur or occurred only during the first day, constitute 53.1 per cent of the entire group as contrasted to 46. 9 per cent of the remaining 6 divisions in which vomiting occurred on and after the first day or after the first day only.

Finally, group 1 determines the normal limitations of postoperative emesis with respect to time and is the standard for reference. In contrasting the other groups with group 1, it will be seen that group 2 approximates more nearly the standard than does group 3.

DESCRIPTION OF RUBBER ENVELOP PADS

The rubber envelop pads consist of two parts, an envelop and a pad. The envelop is made of thin rubber tissue and the pad is made of toweling material sewed together in such a manner as to give firmness and resistance. A loop of narrow tape 10 inches or more in length is sewed to the upper border of the cloth pad. When the cloth pad is placed in the envelop the loop of tape is passed through re-enforced holes located on the upper margins of the rubber envelop. By this means the envelop is closed and the pad prevented from escaping. An iron ring is attached to the free end of the loop of tape for the purpose of indicating the presence of a pad in the cavity. Three pads, two large and one small, constitute a set; the larger are 8 by 8 inches and the smaller 8 by 4 inches.

The rubber envelop pads are used intra-abdominally in the place of gauze pads. Whether the patient is placed in Trendlenburg's position or not, the intestines should be pushed above the iliopectineal line before introducing the pads; the abdominal wall is then lifted with a retractor and one of the large pads folded lengthwise is placed in the region of the cæcum, the other is placed in the region of the sigmoid, and the smaller pad is placed perpendicularly in the middle of the true pelvis. The small pad is again used when the peritoneal layer of the wound is being sutured to keep the intestines from the field of work. It can be removed through a very small opening without traumatizing the peritoneum in the region of the wound.

Gauze pads should never be used in the envelopes as substitutes for towel pads as they do not furnish the required firmness and resistance to keep the intestines away from the field of operation.

CANCER IN THE CERVICAL STUMP; METASTASIS IN THE VERMIFORM APPENDIX

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THE case here reported bears witness to the not infrequent misapplication of surgery: a supravaginal hysterectomy for fibroids of the uterus is performed and a beginning cancer of the cervix is overlooked. The unique site of metastasis in the vermiform appendix is the main reason for putting the case on record. Secondary cancer of the appendix vermiformis has regularly resulted by continuity from the cæcum, or by contiguity where the appendix has become adherent to malignant ovarian or other intraperitoneal neoplasms, or where a diffuse carcinosis of the peritoneum involved the appendix. None of these conditions obtained in the present instance.

C. D. colored, age 47, was admitted to the Denver City and County Hospital on September 20, 1921. She had had four children. It was difficult to obtain details beyond the fact that 1 year previously she had been operated upon for fibroids. The attending physician was later communicated with and informed me that "a supravaginal hysterectomy for fibromyoma of the uterus" had been done. Five months later the patient was treated with radium for cancer of the cervix, by some other physician.

On admission she complained of intolerable abdominal pain, vaginal bleeding, and foul discharge. There was the history of repeated attacks of obstipation closely approaching to complete obstruction.

The patient's condition was poor. The general physical examination proved negative. Below the umbilicus was a median abdominal scar, at the lower end of which was a small sinus such as is due to a retained suture or ligature.

Pelvic examination showed a lax vagina, the upper end of which ended in a crater formed by the cervix and bounded by the infiltrated adjacent lateral parametria. Until definite assurance of a previous hysterectomy was obtained, I believed that a small senile uterus was included in the cancerous mass which appeared adherent to the lower end of the abdominal scar. Rectal examination showed involvement and stenosis of the rectum just within reach of the palpating finger.

A specimen obtained from the crater was examined by Dr. W. S. Dennis and reported to be a squamous cell carcinoma without pearl formation.

On October first the patient developed symptoms of complete intestinal obstruction. These could not be relieved by any of the palliative measures resorted to (passing rectal tube beyond the stricture, stupes, physostigmin, etc.). With great reluctance, a left colostomy was determined upon, but on opening the abdomen through the left rectus muscle the obstruction was found to be due to kinking of the lower ileum by adhesions to the median operative scar. The adhesions were divided, the hugely dilated and paralyzed loop emptied by means of enterotomy and the abdomen closed. The patient did not react and died within 1 hour after completion of the operation.

The autopsy was performed by Dr. Dennis who found no evidence of metastases in the liver, intestines, and peritoneal cavity. He removed the pelvic viscera *en masse* and most kindly placed them at my disposal.

Careful dissection showed a cervix to which were attached the stumps of the round ligaments, the uterine ends of the fallopian tubes, and the uteroovarian ligaments. The end of the abdominal sinus, mentioned in connection with the scar, ended in a small pocket containing a suture leading to the cervix.

The cancer had not broken into the peritoneal cavity, but had invaded the vesicovaginal septum, stenosed the rectum, and infiltrated the parametria (Fig. 1). Numerous retroperitoneal lymph glands (iliac and sacral) contained metastases.

The vermiform appendix, which was non-adherent and hung loosely over the pelvic brim, to cursory examination appeared normal (Fig. 1). On gross section the tip was found obliterated by a yellowish-white mass about 7 by 9 millimeters in size (Fig. 2).

The small tumor was submucous and intramuscular in situation. As can be noted in the low power, Figure 3, the proximal end shows the mucosa crowded out by the tumor which encroaches upon the lymphatic structures as well. The tumor alveoli are numerous and invade both the mucosa and deep musculature. In type the neoplasm is a squamous-cell cancer without pearl formation or cornification, (Fig. 4), and quite identical in morphology with the primary tumor. Sections of the mesenteriolum proved negative.

STUMP CANCER

Cancer developing in the cervical stump after supravaginal hysterectomy is now a well-recognized entity. The question as to whether total hysterectomy is, therefore, preferable to supravaginal amputation has given rise to controversy. Polak (1) recently has collected 256 cases, after hysterectomy for fibroids, from American sources alone.

He vehemently advocates total removal. Leonard (2), who in 1913, reviewed the huge material of Johns Hopkins Hospital found only two stump cancers, the first case appearing 18 years after a hysterectomy performed for pelvic inflammatory trouble. To these two cases may be added the one reported by Tyler (3) in 1915, as this patient also had the primary operation performed at Johns Hopkins. Only three cases from such an active service as that of Johns Hopkins are certainly few.

One of the main reasons for preferring supravaginal amputation to total hysterectomy is the smaller mortality of the former. The comparative mortality in experienced hands has been variously estimated as 2.6 per cent: 6.6 per cent (Botzong, 4) to 1.5: 2 per cent (Polak). Operation for uterine tumor is today performed by every casual operator. Unquestionably, routine complete hysterectomy would at once elevate the mortality rate greatly, and the number of non-fatal injuries to the bladder, ureter, and rectum would rise proportionately. Moreover in Leonard's table (loc. cit., 2.) one out of every four cases resulted, not after removal for uterine tumor, but after hysterectomy for pelvic infection. And, finally, Tyler (loc. cit., 3.) was able to gather 13 cases of carcinoma of the vaginal vault following total hysterectomy. From this it becomes apparent that even complete hysterectomy does not afford an absolute guarantee of subsequent immunity from cancer of the remaining part of the genital tract.

That, in almost half of Leonard's collected cases, some 60 in all, the cancer *appeared within one year* after the primary operation had been performed, is evidence of superficial, careless or unskilled examination in most instances. Only very rarely can the cancer be so small and insignificant as to escape searching scrutiny.

"Coring out" the cervical mucosa with the knife or cautery, at the time of operation, as advocated by Howard Kelly, may be of some service and does not add to the risk. Careful specular examination of the cervix before undertaking the operation, will guard against overlooking a beginning cancer in almost all instances. Excisions from suspicious areas of the cervix should be submitted to the pathologist for examination before operating.

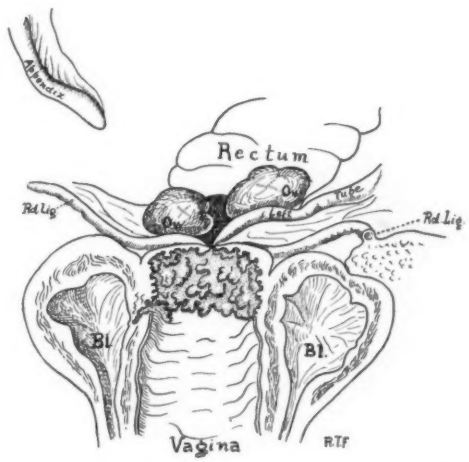
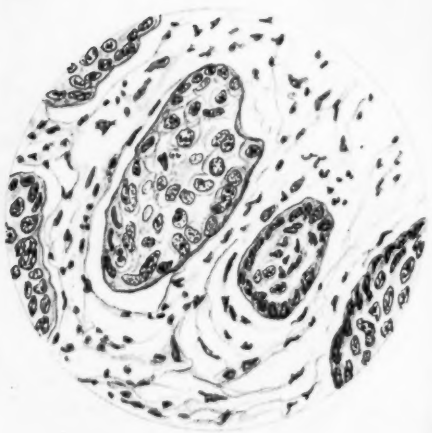


Fig. 1. Dissection of gross specimen. The vesico-vaginal septum has been split and the two halves of the bladder (*Bl.*) reflected laterally. Notice infiltration of septum on left by cancer, also thin shell of cervix above. The appendix hangs free over the pelvic brim. *Ov.*, ovary; *Rd. Lig.*, round ligament.

In view of the fact that even total excision of the cervix may be followed by cancer of the vaginal vault, that stump cancer occurs also after amputation for other conditions besides fibroids, and that the mortality of total hysterectomy is higher than that for supravaginal removal, it appears unwise to advocate total hysterectomy as a routine measure. More emphasis, on the other hand, should be placed upon minute and searching examination of the cervix before operation, in order that an already present cancer may not be overlooked. It is also proper to warn the patient that vaginal bleeding or discharge occurring at any time after the operation, even after years have elapsed (in Fehim's case, 5, the interval was 15 years, in Leonard's case, 2, 18 years), should at once be reported.

METASTATIC CANCER IN THE APPENDIX

The subject is not mentioned in the textbooks of pathology (Aschoff, Kaufmann, Ziegler, Delafield and Prudden, etc.) Howard



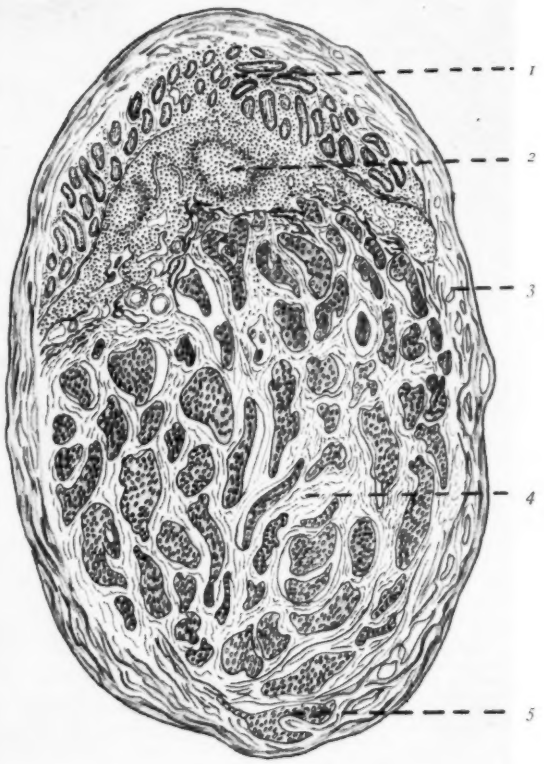


Fig. 2 (above, left). Vermiform appendix split open. Note obliteration of lumen at the tip by a solid growth.

Fig. 3 (at right). Oblique section through tip of appendix (x 16). *1*, Mucosa of appendix pushed away by the tumor; *2*, lymph center below the mucosa; *3*, muscular coats of the appendix; *4*, dense connective-tissue stroma separating the cancer alveoli; *5*, cancer alveolus invading the musculature.

Fig. 4 (below, left). Cancer alveoli of appendicular tumor (high power). The carcinoma cells show the same variations in size, shape, and tinctorial qualities as the cells of the primary cervical growth.

A. Kelly (6) in his book on *Appendicitis* says: "Secondary carcinoma is not uncommon, occurring most frequently by direct invasion, apparently more often by contiguity than by continuity of structure and occasionally by means of metastases." He cites extension from the cæcum, invasion by contiguity of an appendix adherent to malignant intraperitoneal growths, such as ovarian cysts, and involvement in the course of a general peritoneal carcinosis.

Search of the literature, especially that of the doubtful cases of so-called primary appendix carcinoma, has failed to show a case of cancer of the appendix, not primary, arising except by contiguity or continuity (7).

The reason that, in spite of its more than superficial resemblance to primary appendix cancer, of the type of the so-called "carcinoid" growths, I classify this small neoplasm appearing in the wall of a free appendix close to its tip (Fig. 2) as a metastatic growth is twofold. First, the morphology of the cervical growth is identical with that of the appendicular tumor (Figs. 3 and 4). Second, I agree with Eli Moschcowitz (8) who says: "In other respects, they (i.e. solid appendix cancers) differ histologically from other car-

cinomata. The cells are smaller and less atypical; the nuclei show little variation in size and shape, are less rich in chromatin and comparatively free from mitotic figures."

The only other interpretation possible is that the appendicular tumor is primary and that two coincident independent neoplasms occurred in the patient. Multiple primary tumors in the same host are by no means unknown (9). However, when two tumors agree exactly in their minute structure, and when dissemination through regional retroperitoneal lymphatic glands has already taken place, a common origin may be accepted as proved beyond a reasonable doubt.

SUMMARY

The case reported is one of stump cancer, noticed within 5 months after supravaginal hysterectomy for fibroids of the uterus. It is, therefore, fair to presume that the carcinoma was overlooked at the time of the operation.

Complete hysterectomy for fibroids of the uterus is not recommended as a routine measure, because of its increased mortality over supravaginal amputation.

Increased care in examining the cervix, *before* all operations for uterine conditions are undertaken, is enjoined and it is suggested that the patients after operation be warned to note and report bleeding or abnormal discharge.

A metastasis in the non-adherent appendix is reported as a unique site of secondary deposit from cervical cancer.

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THE ASSOCIATED PATHOLOGY OF GALL-BLADDER DISEASE WITH A FURTHER PLEA FOR CHOLECYSTECTOMY[1]

By FRANK D. MOORE, M.D., F.A.C.S., Chicago

IN the last year, it would seem that interest in the gall bladder, its diseases, its complications, and its sequelæ, has been greatly stimulated, as there have been many contributions to the literature of that subject and much discussion of it in medical meetings, conferences, etc., and many and varied have been the ideas presented. The interest aroused and the discussion provoked are alone proof of the incompleteness of our knowledge and an argument for further investigation. Through all this mass of literature, however, and through all the various discussions, certain conclusions seem to be coming inevitably to the fore, namely:

The frequent occurrence of unsuspected gall-bladder disease in association with some other acute condition, the symptoms of which demand and bring about its discovery.

The frequent occurrence of latent gall-bladder disease as discovered accidentally in autopsies.

The discovery of infection or stones in the gall bladder with the subsequent eliciting of a history of long-continued obscure symptoms, usually referable to the stomach and often treated as such, over a long period, before a correct diagnosis is made.

The vast extent of the associated pathology of gall-bladder disease, including practically all of the pathology of the abdominal cavity.

The importance of early diagnosis, both because of the primary trouble and to prevent the occurrence of secondary pathology.

The importance of routine examination of the gall bladder, whenever possible, in any abdominal operation for other pathology.

The growing preference for cholecystectomy over cholecystostomy as the operation *par excellence*, because of the growing realization of its safety in the hands of a competent operator, as well as because of its undoubted superiority in preventing the recurrence of symptoms.

Of the etiology of diseases of the gall bladder, little has been added recently to our fund of knowledge, the idea of focal infections being at present very much in prominence, while other factors are—functional or secretory disturbances of the liver, typhoid bacilli, diminution of the flow of bile from the gall bladder, mechanical obstructions not sufficient to produce jaundice, etc. A number of cases are reported in the literature in which definite foci of infection have been found and demonstrated as probable etiological factors in ensuing gall-bladder infection. Among these, besides pre-existent typhoid fever, were several cases of marked pyorrhœa, septic tonsils and chronic discharge of pus from the nasal cavity. The source of these infections may be hæmatogenous, through the portal circulation, or through the lymphatics. Undoubtedly the field of the etiology of gall-bladder disease is large and probably less explored than that of the symptomatology, but with that field we are not dealing in this paper.

As to the symptomatology, it seems now to be a well-recognized fact that the majority of cases of latent gall stones have, in reality, not been latent at all, but the symptoms produced by them have not been referred to their correct source, but are variously ascribed to gastric disorders, indigestion, etc. Inasmuch as most of the beginning symptoms of gall-bladder disease are referable to the stomach, and are usually situated in the epigastrium, they are often ascribed to gastric ulcer, carcinoma, or simple disturbances of the secretory function.

Distress in the epigastrium, a sense of fullness and discomfort rather than actual pain, flatulency,—these are the beginning symptoms of latent gall-bladder disease and too often the ones least recognized as such. The later symptoms, those of pain in the right hypochondrium radiating to the back, nausea, vomiting, jaundice,—these are the signs of advanced disease, and with these signs we may expect to find no simple, uncomplicated condition, but always secondary pathology,

[1] Read before the Chicago Surgical Society, April 7, 1922. (For discussion, see p. 372.)

and it is with these secondary conditions, the so-called associated pathology of cholecystitis, that we wish to deal here.

And if we have found the field of symptomatology wide, we will find that of the associated pathology tremendous. In a previous paper I have discussed something of the associated pathology of appendicitis and that of the gall bladder is fully as wide-spread, as important and perhaps less often recognized.

Of the various pathological conditions associated together in the abdomen, probably the one most commonly found with gall-bladder disease is chronic appendicitis. From 30 to 40 per cent of cases have been found to be associated in this way. Often an acute attack of appendicitis is responsible for the discovery of gall-bladder disease, which might otherwise have remained indefinitely, giving occasional warnings of its presence, it is true, but for the most part unrecognized because of the vague and indefinite nature of its symptoms. As to whether the disease of the biliary tract is the primary condition, with a secondary infection of the appendix, or whether the reverse may be true, is, of course, not always demonstrable, but it would seem that in a great many cases the preponderance of evidence is for the most part in favor of the gall bladder as the primary focus of infection. The very chronicity of gall-bladder disease, with the slow growth of gall stones and the long periods of so-called "latency," tends to make this seem more probable. In either case it is undoubtedly true that the two conditions frequently co-exist, the one being discovered at operation for the other. Quite naturally, because of its greater tendency to acute exacerbations and because it is so easily diagnosed, even sometimes by the laity, the appendix is frequently the one first to force its way into the limelight and to demand immediate attention. Always, however, is there not the possibility and even probability that early recognition and treatment of the gall-bladder condition would have prevented the secondary infection?

With the occurrence of gall-bladder disease we get often the whole train of symptoms referable to inadequate functioning of the large bowel, stasis, intestinal intoxications, constipation, headaches, biliary migraine, etc. The association in this case is due, in part, to the original source of infection acting simultaneously upon various parts of the body, partly to mechanical forces, such as adhesions following gall-bladder infection, and also to disturbed flow of bile in the intestine.

As it is generally conceded that infection enters the gall bladder and ducts by way of the blood stream and lymphatics, rarely by direct extension, therefore it is to be expected that we should find gall-bladder disease usually coincident with some form or degree of hepatitis, exclusive of abscess-formation. This may be very mild, or it may amount to a true hepatic colic, with typical pain, fever, leucocytosis, and even degeneration of the liver-cells. The biliary type of migraine may be due to this form of infection. Undoubtedly the vast majority of these cases of associated hepatitis and cholecystitis are primary in the gall bladder.

While appendicitis is perhaps the most common abdominal pathology to be found and diagnosed in connection with cholecystitis, there is another condition of even closer connection and more important, because it is so directly dependent upon the condition of the gall bladder and because its treatment is the treatment of the gall bladder. This pathology is that of the pancreas. The close connection found between cholecystitis and pancreatitis is similar anatomically to that between cholecystitis and hepatitis. That is, the opening of the ducts of liver, gall bladder, and pancreas into one common duct, or a practically common duct, places both organs in a position whence they are peculiarly liable to infection from infected bile or where mechanical damage can easily be done from increased pressure and interference with the proper flow of bile. This connection is so close that it has been variously estimated that from 50 to 80 per cent of all cases of pancreatitis are due to or associated with cholecystitis, most frequently with gall stones. Some even go so far as to state that certain forms of pancreatitis, such as the chronic suppurative varieties and the acute hæmorrhagic form, are never found except in association with gall stones or infectious disease of the gall bladder.

This secondary infection of the pancreas may be due to a variety of causes. An obstruction in the common duct may lead to increased pressure and a consequent forcing of bile into the pancreatic duct. This obstruction may be caused by stones, pressure from without, or spasm of the sphincter of the common duct. An infection may travel from the diseased gall bladder to the pancreas, moving along the lymphatics. A chemical change in the bile, due to bacterial action, or a high concentration of bile salts has been found to produce severe necrosis of the cells of the pancreas. Strong contractions of the gall bladder, as in biliary colic, may force bile into the pancreatic duct, with resultant acute pancreatitis. Another interesting explanation is that adhesions from old gall-bladder disease may involve the pylorus in such a way that the sphincter does not close properly and the duodenal contents are thus rendered unusually acid. This hyperacidity, in turn, causes or favors spasm of the common-duct sphincter with the increase in biliary pressure and resultant pancreatitis. Acute hæmorrhagic pancreatitis is by many considered always secondary to disease of the biliary tract, and in many cases it is associated with stones in the gall bladder.

It has been said that in women, the most common co-existing lesion with cholecystitis is appendicitis, while in men, duodenal ulcer is of more frequent occurrence. In these latter cases the diagnosis is very often confused, as the symptoms are frequently misleading, and those of the ulcer may easily overshadow those of the gall-bladder lesion. In gastric ulcer, likewise, there may be much confusion. The initial symptom of cholecystitis is a distress, not a pain, a feeling of discomfort in the epigastrium, dizziness, belching of gas and acid stomach-contents, sometimes nausea and vomiting. Those of ulcer may be very similar, but upon careful examination and inquiry the correct conditions can usually be ascertained. The common association of the two pathological conditions, however, is the thing to be remembered and searched for.

It is exceedingly well known that gall stones are more frequent in women than in men, and it is a matter of frequent occurrence for the gynecologist in operating for pelvic pathology to find a gall bladder full of stones, a condition which may or may not have been suspected previous to the operation. This speaks for the very wide prevalence of gall-bladder infection, particularly in women and especially in the third and fourth decades of life, those being the periods during which most of the pelvic pathology of women comes to operation. Pregnancy often immediately antedates an outbreak of gall-bladder disease in women, the relation here being that the mechanical factors of pregnancy tend to increase the already existing cholecystitis and bring about an acute attack.

Kidney involvement may be secondary to an old infection in the biliary tract. Infection here may travel hæmatogenously to either kidney or there may be direct extension through cellular tissue or lymphatics. Masses of adhesions about the gall bladder may bring about a mechanical displacement of the right kidney, with possible blocking or kinking of the ureter. A few cases are on record of gall stones having perforated the gall bladder and formed eventually, along with other pathology, an extensive infection about the kidney. Functionally, of course, the kidneys are affected in nearly all acute or even chronic infections of the gall bladder, albuminuria, low-grade nephritis or pyelitis occurring.

A very severe type of secondary anæmia frequently follows cholecystitis,—due perhaps to the infection acting as a hæmolytic agent on the red blood-cells, as distinguished from the anæmia of a hæmolytic icterus. This anæmia yields very quickly to removal of the gall bladder and consequent subsidence of the infection.

Lastly, the rôle of gall-bladder diseases as chronic foci of infection is a very extensive one, the importance of which has been recognized only recently. Cholecystitis is capable of setting up metastatic lesions in practically any part of the body and many cases of obscure arthritis, metabolic disturbances, low-grade septicæmias, abscesses, ocular disturbances, etc., are traceable to a diseased gall bladder, and many such cases have been entirely cured by removal of the original source of infection, the gall bladder.

With the marked prevalence of gall-bladder disease in adult life, especially in women, and with the very extensive amount of common pathology which can be traced directly to an offending gall bladder, the need for early recognition and eradication of the cause is increasingly apparent,—the need for early recognition, that secondary pathology may not develop and that the patient's time, health, and energies may not be wasted in useless treatment,—the early removal of the primary source of infection, that secondary disturbances and complications may not arise. Another important point to be noted in this connection is the necessity not only of looking for the gall bladder as a possible source of trouble in other conditions of the abdomen, but also the necessity of looking for associated pathology, once a diseased condition of the gall bladder has been found.

SUMMARY

To summarize, then, we find:

1. The existence of gall-bladder infection is more frequent than is commonly supposed.
2. The amount of pathology due to or associated with disease of the gall bladder is very extensive and is frequently overlooked.
3. The associated pathology of cholecystitis includes practically every abdominal organ and many structures in distant parts of the body.
4. The rôle of the gall bladder as a focus of infection is being more and more realized.
5. Not only should the gall bladder be examined in every pathological condition of the abdomen, whenever possible, but in every systemic condition of unknown origin or uncertain diagnosis.
6. In every case of diseased gall bladder, the surgeon should not be content with removal or other treatment of the primary condition, but should look for possible secondary pathology, that this, too, may be cared for.

In conclusion, it seems fitting to make a further plea for the operation of cholecystectomy over that of cholecystostomy. It seems that in an overwhelming proportion are the surgeons of today turning to the first of these procedures as the operation of choice, and it seems to me that this is rightly so. In review of the various arguments given for removal rather than drainage of the gall bladder, I may cite the following most important points:

1. The greater percentage of cases in which there has been no recurrence of symptoms. Statistics need not be quoted here, but as gathered from various reports in the literature, this percentage has been large. The reasons for this are chiefly that fewer adhesions are formed when a clean removal of the gall bladder is performed than when there is long-continued drainage, especially when various gauze and other drains are used.

Biliary fistulæ occur much less frequently after cholecystectomy than after cholecystostomy.

Stones frequently, we might almost say usually, recur after drainage cases, whereas in total extirpation of the gall bladder, when the ducts are thoroughly explored and care is taken that no stone remains, the re-formation of calculi is very infrequent.

Cholecystitis, as such, does not recur following the operation of removal, whereas it is frequent after drainage.

Convalescence is briefer. There is no long and troublesome drainage necessary in the average clean case, and recovery is less stormy.

As regards the relative safety of the two operations, while the operation of cholecystostomy is undoubtedly attended by fewer immediate dangers in the hands of the occasional operator, cholecystectomy is still, in the hands of an experienced surgeon, a clean, safe, and adequate operation.

If, therefore, we consider the various operations from the standpoint of permanency of relief, cholecystectomy seems, in the majority of cases, to offer this in greater measure than any other operation upon the gall bladder. If this be true, the patient is entitled always to the treatment that is going to be not always the easiest at first, perhaps attended with slightly greater immediate risks, but the treatment that, in the end, is going to give him the most complete and most lasting relief, and this treatment I believe to be the operation of cholecystectomy.

AUTOGENOUS VERSUS HETEROGENOUS BONE PEGS[1]

By GEORGE DE TARNOWSKY, M.D., F.A.C.S., Chicago

WHEN, on December 23, 1914, I used the first beef-bone peg in a transverse fracture of the femur, it was because of the growing belief in my mind that the ultimate fate of all bone grafts was complete absorption and replacement by new bone cells derived, not from the periosteum or osteogenetic layer of the graft, but from the living proximal and distal ends of the fractured bone. I must confess, however—and this same confession will be found in my first paper on the subject, published in Surgery, Gynecology and Obstetrics, in May, 1916—that I resorted to beef bone in my first case only after I had fractured a fibula intramedullary peg and had been refused the use of the patient's other fibula for a second attempt!

No claim to priority was advanced, either at the time of the first use of beef-bone peg in the Cook County Hospital at Chicago or in my first communication on the subject; neither was any effort made to trace the origin of the method. Dr. H. M. Richter first used a beef-bone peg on a patient in the Mt. Sinai Hospital, Chicago, on December 10, 1914, and a few weeks later repeated the same procedure at the Cook County Hospital. Although present at this second application of a beef-bone peg, no claim to priority was made to me by my then colleague on the County Surgical Staff. Both papers concerning the possibilities and limitations of heterogenous bone implants or pegs were presented solely for the purpose of stimulating the controversy which has been going on for so many years regarding the viability of so-called "living" bone transplants. Priority was never considered because, as in a majority of instances at least, careful search of the literature takes us back to the *Papyrus Ebers*, Galen, and the misty past!

In view of the poor success obtained in transplanting non-pedicled portions of muscle, fascia, and entire skin, not to mention the inevitable end-results of all glandular implantations, it did not seem reasonable to suppose that so-called living bone would prove to be an exception to the rule and remain viable when transplanted. Nathan (1) expresses himself most emphatically on this subject, stating: "Osteoblasts are restricted to the cambrium and marrow, and development of bone is confined to these regions. Bone grows in thickness by the deposition of new bone upon the periphery; it grows in length not by virtue of interstitial proliferation of the bone cells, but by proliferation of the cartilage cells at the epiphyseal line; in either case the osteoid tissue is deposited by osteoblasts which, once they have accomplished this, are no longer capable of proliferation. Even pieces of bone with periosteum and osteoclasts attached die when transplanted. Pieces of bone removed and reimplanted into the gaps from which they were taken do not grow in and resume their function. The bone corpuscles degenerate and the grafts are slowly but surely absorbed. What occurs is a more or less complete regeneration of the implanted bone as it is being absorbed. Bone dies when transplanted whether supplied with periosteum or not, and the success of the transplant depends upon the development of new bone." Marmourian (2) in the *British Medical Journal* of December, 1921, states: "All that the bone graft does is to supply the biochemical stimulus or irritant which had been abolished by trauma or infection; the new bone is formed by the diaphyseal ends, by periosteal and bony remains in the shaft zone and, in the young, by epiphyseal lengthening."

Gask, of London, who has had as much experience with war surgery and its reconstructive aftermath as any other British surgeon, speaking of the fate of bone transplants, says: "Those bone cells which are within reach of direct nourishment from the tissue in or on which they lie, may live; the main mass of the graft dies. By the end of the third week (after implanting a so-called

[1]Read before the Chicago Surgical Society, April 7, 1922. (For discussion, see p. 370.)

living graft), new channels appear in the necrotic graft, penetrating from its periphery, carrying vascular loops and giant cells which continue to absorb the old bone. New bone cells also form on the surface of the graft. Eventually the whole of the graft is absorbed and replaced by new bone produced by the activities of the surviving cells. Bone grafts in contact with living bones are attacked by the cells of the living bones, invaded, and replaced. The only advantage of a living bone graft is that some of the peripheral bone cells, in contact with free blood, will continue to live and thus assist in the bridging over of the gap" (9).

E. W. Hey Groves of the University of Bristol, while believing that a living bone graft may act as a living tissue which under suitable conditions will build up new bone, admits that it also acts as a strut and a scaffold along and around which living bone spreads. This second function of a graft, he states, can be undertaken by dead bone as well as by living, and there are certain conditions in which dead bone is actually better than living bone for the purposes of a graft. He illustrated this point by exhibiting two tibias of a cat into the left of which he had fixed a living graft while a dead bone graft had been fixed in the right tibia, with identical results. That Groves has no faith in the osteogenetic power of the periosteum is manifest, for he states: "It has often been suggested that the periosteum surrounding the shafts of bone has an inherent power of forming new bone, and that, by taking flaps of this membrane, bridges may be formed which will cover in gaps and defects in the bone; but such an idea is founded upon false observations, and any attempt to fill up a gap formed by periosteal flaps will be doomed to failure, because such flaps after throwing out minute pieces of bone may then be absorbed long before continuity has been restored" (2). The purely mechanical value of the restoration of continuity is shown by Groves in the case of a child from whom the central portion of the humerus had been resected for fibrocystic disease. The operation involved the removal of 3 inches of the entire thickness of the shaft of the bone, while preserving the vascular periosteum. A two-piece graft made of boiled beef bone was implanted in the medullary cavity, and a roentgenogram taken 1 year later showed that the contour of the original bone had been restored. Somewhat sarcastically, he remarks: "It is a somewhat remarkable reflection on the mistaken idea which has sometimes been held regarding the dangerous nature of dead bone, to think that one can deliberately bury a large piece of bone which is not only dead, but which is not even human, in the skeletal tissues, that such tissue will be tolerated, then incorporated, and lastly slowly absorbed."

So far, there seems to be no logical reason for a change of opinion regarding the ultimate fate of all bone grafts, and my only excuse in bringing the subject up for discussion before the society is to find out what proofs, if any, the advocates of the permanently "living bone graft" can adduce in support of their belief, and to produce evidence that not only ivory inlays, screws and nails as used by Magnuson, are well tolerated and slowly absorbed, but that the beef-bone peg or inlay is equally non-irritant in a majority of cases. My deductions are based on personal results obtained in 17 cases of beef-bone pegging and the use of ivory screws or nails in approximately 50 cases. Of the 17 cases, 10 were for fractures of the femur, with one postoperative death from hypostatic pneumonia, 2 for unimpacted fractures of the neck of the femur with non-union, 3 for fractures of the humerus after reduction had failed, and 2 for double fractures of the leg. Intramedullary pegs were used in all cases, my prime object being to evolve a simple technique which might be available to the average surgeon in the average hospital. The surgical instruments were for this purpose strictly limited to an ordinary hand saw, chisel, and mallet for the preparation of the beef-bone pegs, and Lane's bone-holding forceps and levers in addition to the ordinary bone set. In fractures of the femur, the peg should be 4 inches long for transverse fractures, 5 or even 6 inches long for very spiral or comminuted fractures; its diameter should be ½ inch. For fractures of the tibia or humerus, the peg should be 4 inches long and from ⅓ to ¼ inch in diameter. Any of

the long bones of a steer will answer the purpose. The bone is denuded of its periosteum, cut to the proper size and boiled 2 consecutive days for 2 hours. The pegs are then kept in a sterile container and the peg needed for a given operation is resterilized with the instruments. It is of prime importance to fit the peg to the medullary canal and not to drill or gouge the canal in order that the peg may fit into it; under no circumstances should bone marrow be curetted away as we thus deprive living bone of its chief blood supply. The graft must be in perfect contact with healthy vascular bone above and below, it must be of sufficient length to reach well into living bone and it must be immobilized in this position. Occasionally, ivory or bone screws may have to be applied in order to insure against slipping of the peg. The introduction of the peg, after angulation of the seat of fracture after the technique of Lane, does not present any difficulties. In order to divide the peg evenly between the proximal and distal fragments, three-fourths of it may be introduced into the medullary cavity of one fragment and then, after alignment of the bone and introduction of the peg into the other fragment, one of two methods may be used to obtain the proper division of the graft and thus prevent the possibility of angulation. If a gap exists between the fragments, the peg is pushed up or down the required distance by means of a mallet and chisel; if no gap is present, an oblique hole is drilled over the long end of the peg into the medullary canal and the detached drill is used to punch the peg into place. Prior to alignment of the fragments, both ends must be thoroughly freshened with the bone curette or chisel, and after immobilization of the peg the soft tissues must be closely coapted over the repaired bone to insure its close contact with free blood before closure of the skin. No dead spaces must be allowed between bone and muscle or fascia.

During the slow process of absorption and replacement of a bone graft, there is relatively little strength to the graft and the limb must be protected from strong muscular action or weight bearing. Gask is of the opinion that protection must oftentimes be maintained for from 12 to 24 months. This period is not sufficiently emphasized and undoubtedly accounts for the failures reported with either autogenous or heterogenous grafts.

Of the seventeen pegs, only one was removed to my knowledge. This case was a compound comminuted fracture of the right tibia and fibula in which the bone fragments and muscles were ground full of pieces of gravel and slack. We introduced the beef bone too soon, acute osteomyelitis set in, and the patient drifted into the hands of another member of this society who removed the peg and finally obtained bony union. The other 16 cases and all of the ivory nails and screws were retained and well tolerated. All were observed from periods varying between 3½ and 6 months; all obtained firm bony union with roentgenographic evidence of slow absorption of the foreign body.

It is useless to remind the members of this society of the difficulty of keeping track of County Hospital cases, and only recently has it been possible to stumble on one case which was operated upon in July, 1915—almost 7 years ago—at which time a beef-bone intramedullary peg was introduced in the lower third of the right femur. This was case No. 570,178, Cook County Hospital.

Mrs. L. W., age 46, admitted June 18, 1915, with a comminuted fracture of the lower third of the right femur with outward and backward displacement of the fragments, the proximal fragment displaced outwardly for an inch, and a spicule of bone lying in the distal medullary cavity. Both proximal and distal fragments were fissured for a distance of 3 inches. The right lower extremity had been atrophied since the age of 9, at which time the patient had suffered from an acute anterior poliomyelitis. She had always been obliged to walk with the help of crutches or canes.

Between June 18 and July 8, 1915, repeated attempts at reduction had been made, without any success, and my colleague, Dr. Paul Morf, very courteously turned the case over to me for open repair. The operation, performed on July 9, consisted in the removal of many loose spicules of bone lying in the surrounding tissues and of one large one in the proximal medullary cavity. A 4-inch beef-bone peg was introduced; this was a mistake as a 5- or 6- inch peg would have extended beyond the fissured shaft and held firmly. The patient was put up in a body-thigh-leg cast. Owing to a change of services, the case was not followed as closely as was necessary and the new internes removed the cast

for what they termed a moderately severe infection. The splints and traction which replaced the cast failed to prevent some degree of angulation. By September, 1915, the infection had entirely cleared up, but there was only slight attempt at bony repair.

This case was classed in the original paper as an operative failure because both the proximal and distal fragments of the femur were fissured for a distance of 2 to 3 inches, satisfactory firm coaptation of the peg was impossible to obtain, and some degree of angulation occurred. In May, 1921, this same patient presented herself at the Ravenswood Hospital with a request that she be relieved of a fibrous ankylosis of the right knee which had persisted since she left the County Hospital. The plates exhibited were taken in May, 1921. They show extensive formation of new bone and there is present in the shaft of the bone what appears to be a sequestrum 10 centimeters long by 1½ centimeters wide. We purposely refrained from telling the hospital roentgenologist that a beef-bone peg had been introduced in this case in 1915, because we did not wish to bias his report. This peg represents a typical case of eburnation as its outline is still quite clear and it is evident that there is no attempt at absorption going on.

Of recent cases of beef-bone pegs reported, the following present more than ordinary interest as they illustrate the value of this method in bridging large defects.

CASE 1. C. W. Gordon Bryan, *The Lancet*, May 28, 1921. A case of osteitis fibrosa treated by resection of 4 inches of humerus and the insertion of a boiled beef-bone graft. Bryan drilled his graft full of holes, believing that by this means the obsteoblasts would proliferate more rapidly and the osteoclasts become more active. The operation was performed in November, 1920, and the last roentgenogram taken on March 24, 1921, showed the drill holes filled with new-bone cells. The idea seems a good one and we intend adopting it in future. In this case the peg was driven distally into the medullary cavity and embedded proximally in the spongy tissue of the head of the humerus.

CASE 2. P. Maynard Heath, *Proceedings Royal Society of Medicine, Section of Surgery*, January, 1922, reported the case of a 9-year-old boy suffering from fibrocystic disease of the humerus in whom he had removed the diseased bone and introduced a beef-bone graft in June, 1921, obtaining firm union with a large amount of new bone around the graft.

CASE 3. Hey Groves, of Bristol, in addition to his many successful grafts on cats, reported several complete successes on human beings, using beef-bone grafts. In fractures of the humerus he advocates the use of two beef-bone grafts. One is thrust into the upper fragment, the other into the lower, each graft being allowed to project to a distance equal to that of the gap. The two projecting pegs are fitted and screwed together.

Fig. 1. Roentgenogram taken in May, 1921, 7 years after transplanting beef-bone splint.

CONCLUSIONS

The clinical behavior of a beef-bone graft depends entirely on the relative activities of the osteoblasts and osteoclasts:

1. With proliferation of new cells from the living proximal and distal ends of the fractured bone keeping pace with absorption of dead cells from the graft, complete disappearance of the latter coincides with complete union of the fracture or filling in of the defect.

2. With hyperactive new cell formation and sluggish absorption, the graft constitutes a sequestrum which either eburnates and remains in a state of quiescence or acts as an irritant foreign body with sinus forma-

tion and periodic extrusion of dead bone spicules.

3. With hyperactive bone absorption and sluggish new-bone formation the graft disappears by combined extrusion and absorption before union or filling in of the defect has taken place.

The factors which enable us to attain the ideal, i.e., an even balance of absorption and proliferation are: first, the thorough trimming off of dead bone proximally and distally with curette and chisel; second, firm approximation of the bone graft to living bone; and, third, absolute asepsis.

Finally it has seemed to us that the term infection, as applied to bone surgery, is too loosely used and that in many cases of so-called septic results we are merely dealing with type three, i.e., rapid necrosis of the graft without infection—using the latter term in its proper sense. In other words, subacute osteomyelitis, with no anti-body reaction on the part of the individual should not be classed as an infection but as ordinary tissue necrosis.

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DEPARTMENT OF TECHNIQUE

KINEPLASTIC AMPUTATION OF FOREARM—TRIMOTOR[1]

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KINEPLASTIC amputations are of indisputable value. Because of scientific principles based on the neuromuscular physiology of the kinetic motor, because of improved and perfected operative technique, because of the results obtained in the function of the motor, and because of the improvements which have been made in kinematic protheses—for all these reasons, I say it is hardly believable that surgeons should regard with wilful disdain a problem of such grave importance.

Indeed, the benefits to be derived from the regular practice of such amputations are incalculable, and these benefits apply as well to humanity, to the state, and to the individual as to perfecting the technique of mutilative surgery, which, since the last terrible European war, has become a subject of intense interest.

To realize the desideratum of the surgeon, that is, to restore normal function to the amputated limb, giving to the protheses such movements as will enable the patient to perform at will the natural physiological functions of the mutilated member, constitutes, in fine, the trend of modern surgery. Kinematization, or kineplasty, as it has also been termed, is a procedure which no operative method hitherto known can put into practice. By means of kineplasty there is constructed on the segment of the amputated limb, a kinetic element termed "motor" which has the property of transmitting a living, voluntary, natural force to the respective prothesis and by means of this force the prothesis is endowed with active motion, governed by the patient's will.

When I began my studies, 4 years ago, I performed only simple operations, furnishing stumps with one motor (unimotor), as shown in Figure 1.

Later when I had acquired greater practical and theoretical knowledge, I ventured to perform operations which would produce two motors (bimotor), and obtained very encouraging results (Fig. 2). Finally, I have succeeded in giving to the patient whose case is presented in this present article, a stump with three motors (trimotor) by means of which an artificial hand may be worked. With three distinct, voluntary forces, independent of each other, the hand is capable of performing varied and even complementary movements resembling those of a normal hand.

The technique which I have followed in the construction of motors is that described by Pellegrini (2). The patient I treated was a poor man, who had lost both of his upper limbs. On the stump of the lower third of the right forearm, I succeeded in getting three motors which would reproduce the natural movements necessary to move the hand prothesis.

The first motor was constructed by suturing, in handle form, the superficial flexor muscles with the deep-lying flexors (Fig. 3, 1). In order to bend the fingers of the artificial hand, the patient contracts the same muscles which he used for closing the hand lost by mutilation, and the new adaptation of the motor to the prothesis, will, therefore, be made easy because of its similar function.

It is worthy of note that the re-education of the disabled is facilitated by using in the construction of the motors, muscles which must continue to work in the fashion intended by nature, as was done in the case illustrated.

The second motor was constructed on the under surface of the forearm with the common extensor muscles of the fingers. The same technique was followed, the extensors being sutured with the rear cubital in handle form. With this second motor the fingers of the prothetic hand could be extended. In this instance I made the epidermic tunnel of the motor "eye" larger, as it is good and sound technique to build "eyes" of large diameter. With such an ample organic coupling there is a larger area of adaptation for the appliance of prosthetic or inorganic insertion, hence, the motor power is transmitted to the prothesis without any of the drawbacks of ulceration of the skin of the tunnels, as occurred with my first patients (3).

[1] From the service of Dr. Delfor, Del Valle, Pinero Hospital, Buenos Aires.

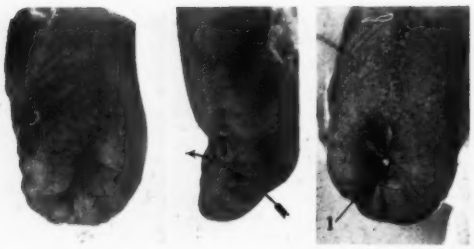

Fig. 1. Motor with a single handle "eye." Operative results after 10 days. *1*, "Eye" with epidermis healed. The arrow indicates the direction of the "eye."

Fig. 2. Double motor for leg (bimotor).

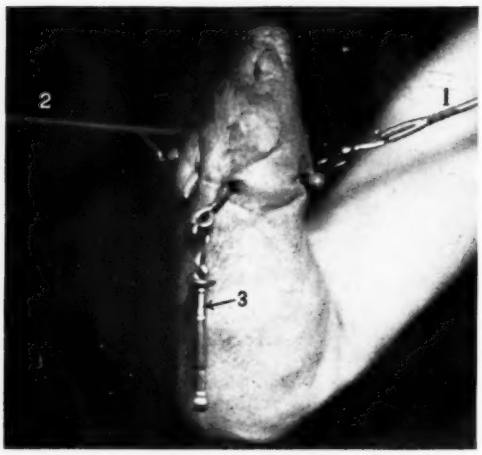

Fig. 3. Trimotor of forearm. *1*, Flexor motor; *2*, extensor motor; *3*, motor for thumb.

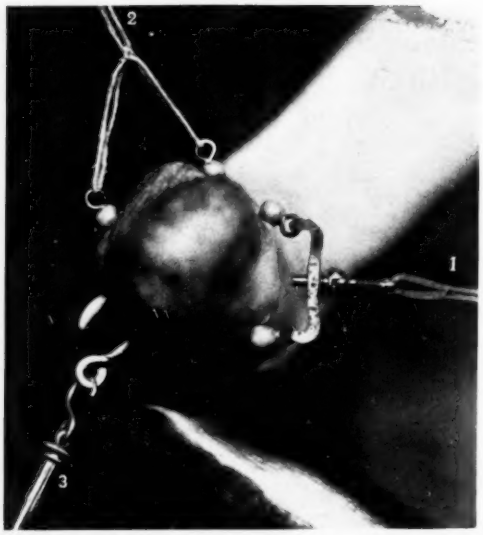

Fig. 4. Stump of forearm with three motors seen from front in order to gauge distribution of periphery. *1*, Flexor motor with tractor appliance; *2*, extensor motor; *3*, motor proper to thumb.

The larger the motor "eye" the surer will be its practical results. This has been proven not only clinically but also as to a principle of mechanics; i. e., the greater the friction, the more wear and tear, and conversely the less friction, the less attrition. A small motor "eye" produces in the patient greater wear and tear, for it causes greater friction and the skin suffers, becoming abrased, eczematised, and ulcerated. On the other hand, a large "eye" of ample diameter, 1 centimeter, furnishes a greater area of adaptation with less attrition and less friction to the skin, and ulceration of the epidermis is less likely to take place.

The third motor I made on the outer surface of the forearm (Fig. 3, *3*). A similar technique was used and the extensor muscles of the thumb were sutured. Cicatrization was excellent and there were no complications worth mentioning.

Voluntary exercise of the three motors was begun. At first, the function, as well as the motor power, was at a minimum, but with time and the perseverance of the patient, greater mobility and potency were attained. For exercising, the patient used an appliance with an ordinary hook from which hung a small bag of sand. The forearm was held close to the body in a hanging position while the exercises were done. Every fortnight the weight of the sand bag was increased by filling up with more sand, and the

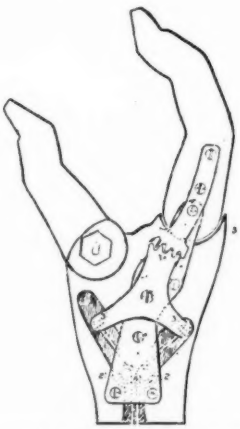

Fig. 5. Kinematic hand for a bimotor of forearm constructed by Fusaroli, Rizzoli Institute, Bologna.

Fig. 6. Fusaroli's kinematic hand. During the "pose" the patient worked his motor (*1* and *2*) and the fingers closed. With these finger movements, the patient is able to feed himself, smoke, write, etc.

usual exercises were carried out. The three motors were trained in like manner, but the first one was the most easily trained, perhaps, because the patient himself devoted more attention to it.

Nevertheless, we felt satisfied with the result and believe that, when the patient is provided with a complete prothesis and finds it necessary to use the corresponding motors, there will be improvement in both scope and power.

A year after operation the patient's forearm was found in highly satisfactory condition. The stump with its three kinetic "eyes" is shown in Figure 3. The three motors are side-motors of the type invented by Pellegrini, and their perfect condition may be observed in the figure. Motor *1* is the flexor; *2* is the extensor, and *3* is that of the thumb. Viewed from the front (Fig. 4), the stump is gauged in its peripheral distribution. As the operative technique plan had now been completed it remained for me to complete the result by means of a prothesis.

Under Professor Putti's direction, the mechanical problem has been studied with singular success, and the orthopedist Fusaroli has constructed a hand for a bimotor of forearm. This is the one I placed on my patient (Fig. 5).

The hand is made so that it will produce movements of the metacarpophalangeal joints, making them work in harmony. There are really no interphalangeal joints, that is, the fingers are stiff but are made as if half bent, resembling the position of the fingers in repose. The movement of the fingers is effected by means of this appliance, and they flex or extend by means of the two tractors corresponding to the flexor or extensor motor as the case may be. The thumb is moved by the aid of the metacarpophalangeal joint, and is passive, that is it is not constructed so as to be moved by a motor. In my patient, the third motor, constructed precisely from the extensor muscles of the thumb, is used to work the thumb, passive extension being accomplished by means of a spring.

To sum up, Fusaroli's hand is fitted for adjustment to a bimotor of the forearm, using one tractor for flexion and the other for extension. The thumb is immovable. As my patient has three motors and one of these is worked by the extensor muscles of the thumb, it is logical that I should wish to make use of this unique and important finger. I am working along these lines and hope to re-educate the mutilated limb. This is of primary importance, inasmuch as the mechanism for working the thumb is very simple. The metacarpophalangeal joint is a movable one. Extension is produced by means of a spring, and flexion is brought about by the third motor which, at present, has proven so satisfactory as to encourage hopes of greater result.

My patient, who had lost both upper arms, was in a desperate condition. It was painful to hear him tell of the trials and misfortunes of his private life, for he was the father of a family for whom he must provide through his own efforts, and his task became an almost insurmountable problem. More than once, I thought that my

Fig. 7. Film showing finger movements.

promise to give him a hand might not prove true and the man would be deprived of the only illusion left to him. He became so desperate that he had planned suicide, but thanks to my promising unconditionally, absolute success, I was able to keep the poor fellow from carrying out his threat. He relied absolutely on me, and I was glad to be able to secure three motors, which I trust will give as excellent results as I obtained with the flexor motor.

The prothesis was modified and mounted by the orthopedist, Scheurer, who has always seconded me in this humanitarian and scientific work, and to whom I owe in part the admirable success obtained. I acknowledge most gratefully his labors.

After 3 months' practice, the patient is able to eat easily without any assistance, holds a glass to drink from, smokes, takes off his hat, handles many things required in daily life, writes, etc. (Fig. 6). To present real and tangible proof—a living document—of the result in my case, I have taken films, showing the patient doing ordinary things (Figs. 7 and 8).

The fact is worth stressing that the poor cripple is like another person, as is often said, for he enjoys living to a degree as encouraging as his previous depression was alarming. The joy he has in feeding himself, drinking water freely, smoking, etc., is spontaneous and effusive, for he feels that he is now a useful member of society and can enjoy his home with his dear ones. He wants to secure employment in the factory where he was injured. He has a stimulus for work.

I should be sorry to be termed a visionary for expressing myself in such enthusiastic terms, but I have seen and felt the unlucky fate of the poor cripple, and have witnessed the sudden change effected in him upon acquiring a hand, through which he is able to perform, at his own good will and pleasure, acts, which though elemental, are none the less interesting. Above all it is gratifying that we have succeeded in dispelling his intense depression.

Fig. 8. Film showing lighting cigar and smoking.

Naturally, in order not to become too enthusiastic in judging the results secured in this case, I must consider that besides the psychological effect upon the patient, we have at the same time succeeded in interesting him in perfecting the apparatus, and he is convinced that his future is dependent on his own will. All his cheerful enthusiasm converges toward a definite end which he glimpses inwardly and clearly: *to utilize his artificial hand as he did his own.*

It is as well to state that in the present development of kineplastic surgery, we can hardly accept such optimism, and if I encourage my patient to a certain extent to believe this, that does not mean that I hold the same enthusiasm, for it must be said in justice to the subject that in reality one is confronted with insoluble biological problems.

The grafting or transplanting of entire limbs, therefore, suggests itself to us as the desideratum of plastic surgery, but here, again, we must not let our enthusiasm unduly influence our better judgment. Let us then pass over the theoretical considerations, and say in conclusion, that our real object in doing kineplastic amputations is to help solve the problem of the welfare of these unfortunate cripples.

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PRESERVATION OF THE MOTOR ROOT OF THE GASSERIAN GANGLION DURING THE DIVISION OF THE SENSORY ROOT FOR TRIFACIAL NEURALGIA

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IT is possible to preserve the motor root of the gasserian ganglion by anatomical dissection without the aid of faradization during the division of the sensory root for trifacial neuralgia, and I wish to present the technique employed since March, 1922, in nine consecutive cases, in which satisfactory results were obtained.

ADVANTAGES AND DISADVANTAGES OF THE RADICAL OPERATION

It is quite generally accepted that the radical treatment of trifacial neuralgia is the division of the sensory root of the gasserian ganglion except in cases in which the diagnosis is doubtful or the duration of symptoms short, and then deep alcohol injection should be employed once, twice, or possibly three times, or in cases in which the division is too great a surgical risk. Inasmuch as the radical operation is attended with fewer and fewer complications, the patient should be advised to undergo operation rather than be carried along indefinitely on alcohol injections. There are special indications for the avulsion of peripheral nerves, but as a rule, better palliative results follow alcohol injections, except perhaps in the distribution of the ophthalmic division, particularly the supra-orbital and supratrochlear nerves, which are difficult to inject; moreover the procedure is sometimes attended with serious complications in the orbit. Some of the primary objections to the division of the posterior root are as follows:

1. Hæmorrhage. This now rarely gives trouble, owing to the changes in technique, the ability to control hæmorrhage by ligation of the middle meningeal artery and packing with cotton pledgets, and to the use of special instruments, such as the illuminating retractor, the dissecting hook, and so forth.

2. Ocular palsy, due to hæmorrhage and trauma to the third, fourth, and sixth cranial nerves. This has been obviated by traction on the dura in the exposure rather than application of pressure against the tissues in the vicinity of these nerves.

3. The high mortality rate. This was due to hæmorrhage and trauma to the brain, and has been lowered by the reduction of the time for the operation. At one time, from 2 to 3 hours were necessary to complete the operation; now, it can be performed in 1 hour or less, including time from the giving of the anæsthetic until the wound is closed and the patient is ready to be sent to his room.

4. Traumatic keratitis or trophic keratitis. This has been diminished by the avoidance of unnecessary trauma to the ophthalmic portion of the gasserian ganglion, and by protection of the cornea from abrasion during and immediately following operation. The patient should be acquainted with the anæsthesia of the cornea and cautioned against the entrance of foreign bodies into the eye which would scoriate the cornea.

5. Occasional facial paralysis. This complication develops occasionally regardless of the technique employed or the care exercised by the surgeon. We have all had the experience of performing a long series of operations without facial

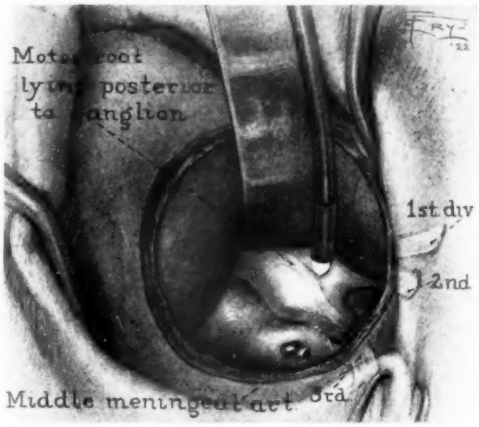

Fig. 1. Exposure of the gasserian ganglion with its arachnoid covering previous to division of the posterior sensory root.

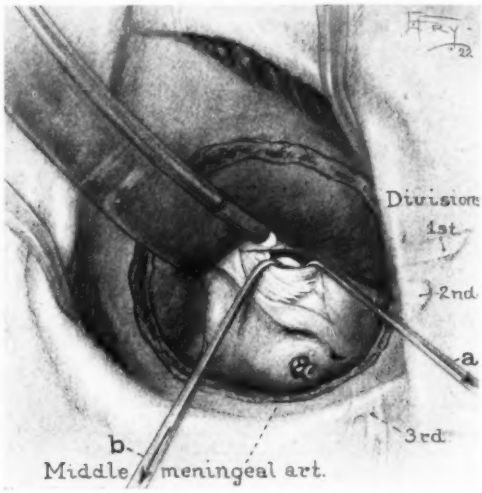

Fig. 2. Exposure of the motor root on the mesial side of the sensory root fibers of the gasserian ganglion by elevating and retracting the sensory root fibers forward, downward, and outward just as they emerge from the gasserian ganglion.

paralysis, and then the condition develops without any known reason. Many theories have been presented with regard to its probable cause. It is consoling to know that the facial paralysis is usually only temporary, and recovery is spontaneous, but the cornea must be protected during recovery.

6. Numbness of the face, eye, and margin of the tongue along with paralysis of the pterygoid, masseter, and temporal muscles. It is true that the numbness is quite annoying, especially at first, but it is much the same, although less extensive, than that which follows successful alcoholic injection or peripheral nerve avulsion. However, the patient who has had one or two recurrences of true trifacial neuralgia gladly accepts the numbness in exchange for the spasmodic, excruciating, lightning pains incident to the disease.

7. Paralysis of the pterygoid, masseter, and temporal muscles disturbs the alignment of the jaw on opening, prevents good coaptation of the teeth on the side operated on, and causes atrophy of the muscles and depressions above and below the zygoma. While it is possible to preserve the motor root and thereby prevent motor paralysis, there is no particular object in saving the motor root in a very old patient who has had all of his teeth removed on the affected side and who does not intend to use a plate. Nor is it wise to save the motor root if the question of time is an urgent factor in the operation on an elderly patient. However, the preservation of the motor branch is an added refinement in the technique and avoids paralysis of the two pterygoid, masseter, and temporal muscles. It should also be preserved, since there are a few double neuralgias and because patients are coming for the radical operation earlier in the history of the disease when still possessing a few teeth on the side affected by the neuralgia.

While it was necessary to rely on faradization of the motor root in order to determine absolutely whether or not it was preserved, the technique was very tedious, prolonged, and uncertain on account of the electric current jumping from sensory fibers to motor fibers, and giving rise to false interpretations. With the development of this technique, I find it possible to dissect the sensory root from the motor root and divide it without injury to the motor root in approximately the same time that is required to expose and divide the entire posterior root of the gasserian ganglion.

The motor root, as it enters the middle fossa over the petrous portion of the temporal bone through the hiatus in the dura, is found underneath the sensory root on the mesial side; it continues in that relation under the root fibers until it approaches the gasserian ganglion body, when it turns fairly abruptly and passes obliquely downward and outward underneath the gasserian ganglion through a separate sheath of the third branch into which it diffuses.

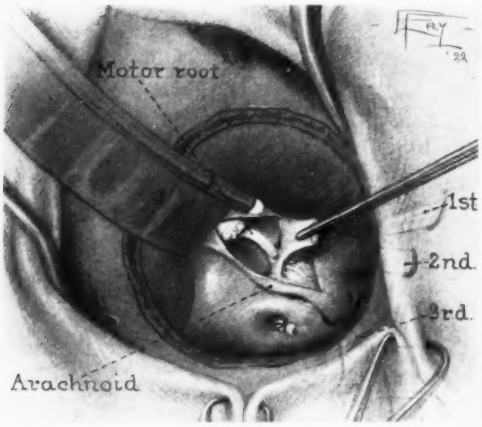

Fig. 3. Elevation of the divided posterior sensory root fibers exposing the motor root as an independent fasciculus entering a separate sheath beneath the ganglion body before submerging into the third branch of the gasserian ganglion.

Fig. 4. Case A386731. Normal symmetry of the face due to preservation of the motor root in the division of the sensory root of the gasserian ganglion.

TECHNIQUE OF OPERATION

The ganglion is exposed through an oblique incision of the skin, temporal fascia, and temporal muscle, situated 1 centimeter in front of the ear and extending upward and backward from the zygoma for 7 centimeters. This is followed by a decompression opening in the skull which is about 3 centimeters in diameter, after which the dura is elevated, the middle meningeal is ligated, the third branch identified, and dissection carried upward and backward elevating the dura from the arachnoid which is attached to the ganglion, until pulsation can be seen above the ganglion. These pulsations occur over the posterior root and are due to changes in cerebrospinal fluid by the pulse of the cerebral vessels (Fig. 1). The arachnoid covering the posterior root fibers is then opened by a small, sharp, right angled knife, exposing all sensory root fibers and the outer part of the gasserian ganglion (Fig. 2).

After bleeding is controlled my associate holds the illuminated retractor which gently elevates the temporal lobe, holds the dura taut, and exposes the posterior margin of the gasserian ganglion along with the sensory root. The small dissecting hook *a*, in Figure 2, is then placed over the sensory root fibers on the mesial side just as they enter the ganglion; these are retracted gently in a downward and forward direction, elevating slightly the posterior sensory root fibers and the posterior margin of the gasserian ganglion on the mesial side. Hook *b*, in Figure 2, catches the mesial side of the sensory root, but not underneath, and elevates by traction downward and outward sufficiently to expose the motor root lying as a separate fasciculus underneath and independent of the sensory root presenting a downward course toward the third branch rather than following the sensory root fibers upward and inward to the mesial side of the gasserian ganglion.

After the motor root is brought into view, the sensory root is held away from the motor root by hook *a*, and dissecting hook *b* is replaced by a small sharp right-angled knife, cutting the sensory root fibers without injury to the motor root (Fig. 2.)

After this, it is well to elevate the posterior margin of the ganglion (Fig. 3) to make sure that no sensory fibers remain intact. There is no danger of mistaking the motor root fibers for the sensory fibers, inasmuch as they enter a separate sheath beneath the gasserian ganglion body before diffusing in the third branch of the gasserian ganglion. Precautionary care should be exercised carefully to examine the hiatus in the dura over the petrous bone, and to avoid leaving sensory

fibers either on the mesial side or on the lateral side of the posterior root.

I have used this technique in nine consecutive cases since March 16, 1922, and have had no difficulty in preserving the motor root, being able to divide the sensory root just as quickly and as accurately as when dividing the entire posterior root, sensory and motor. After division of the posterior sensory root, one must be cautious to avoid unnecessary sponging of the motor root, as the slightest trauma will impair the function of the pterygoid, masseter, and temporal muscles; the impairment is, of course, only temporary, but if a perfect result is expected, trauma to or traction on the motor root must be avoided (Fig. 4).

CONCLUSION

I do not claim to be propounding a new theory concerning the advantages of the preservation of the motor root, nor do I wish to detract from the value of any technique employed for the preservation of the motor root during the division of the sensory root for trifacial neuralgia. The technique is submitted because it can be quickly and easily carried out without the uncertainty that comes with faradization.

A CASE OF PRIMARY CARCINOMA OF THE FEMALE URETHRA TREATED WITH RADIUM

By LAWRENCE A. POMEROY, M.D., F.A.C.S., and FRANK W. MILWARD, M.D., Cleveland, Ohio
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THAT primary carcinoma of the female urethra is a rare disease is shown by the fact that the subject has received but scant attention in standard textbooks on gynecology. Likewise, but few authenticated cases can be found in the literature.

Kelly and Burnam (1) describe primary urethral carcinoma as a rare disease in which the cancer begins in the mucous membrane at the external margin of the urethral canal or at some point between the external and internal meatus. They state that it may arise also from Littré's or Skene's glands, and that it may be either squamous-celled carcinoma or cylinder-celled (glandular form). The first form, they say, "spreads throughout the length of the urethra and extends into the bladder, or pushes out into the neighboring tissue in cancerous nodes. It may appear at the external urethral orifice, ragged, deeply cleft, and bleeding. Its lymphatic extension is up the inside of the pubic ramus and into the inguinal glands. The superficial, external form develops a hard, infiltrated, flattened area of ulceration spreading out over the surrounding mucosa, involving the vestibule and clitoris, as well as up under the mucosa of the urethra." This is as good a description of the subject as we have been able to find. Kelly and Burnam suggest two points which seem to be borne out in our case, namely (1) that the disease develops in a urethral orifice which has been infected by a low grade chronic inflammation often found in women (caruncle probably preceded the disease in our case), and (2) that, surprising as it may seem, these patients usually retain urethral control. In our apparently well advanced case the patient retained control of the urethra.

O'Neil (2) brings the subject up to date and emphasizes the fact that the disease is frequently incorrectly diagnosed. He reports his own case and eight others from the records of the Massachusetts General Hospital, and quotes cases reported by various authors, including the very complete and critical summary by Percy (3). O'Neil's report includes 68 cases of primary carcinoma of the female urethra which have been reported to date. We wish to report an additional case which we feel to be worthy of note in that it calls attention to the fact that carcinoma, uncommon as it may be in the female urethra, seemed in our case to have followed a caruncle, which we all know to be characterized by its frequency.

December 21, 1921, Mrs. L. M. entered Huron Road Hospital, referred from another institution. She complained of bleeding from the vagina accompanied by sharp pain which became worse when she voided. The patient was a colored woman whose age was indeterminate but judged to be in the seventies, since the patient "was old enough to wash dishes when the Civil War was in progress." The family history contained nothing of importance. The patient had always been well in the past and remembered no other illness except some obscure disease in her early childhood.

Her present illness began 5 years ago when she began to have some bleeding from the vagina accompanied by itching. This soon quieted down but recurred after a few months and gradually grew worse. For the past

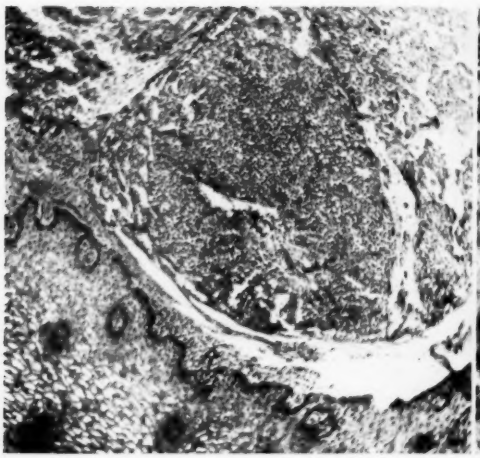

Fig. 1. Low power photomicrograph of tumor.

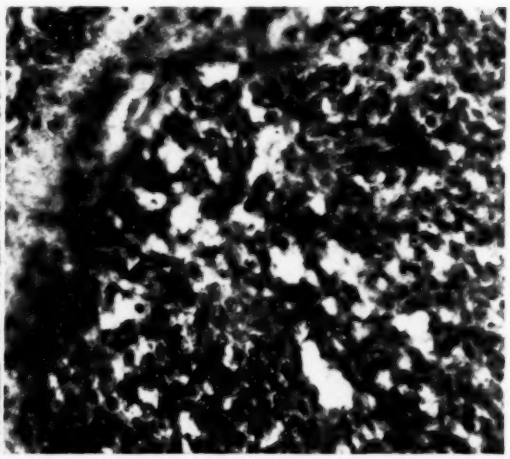

Fig. 2. High power photomicrograph of tumor.

2 years she had had these attacks of pain and bleeding "off and on" at intervals of 2 or 3 days and lasting a few hours each time. She had had some frequency of urination, usually rising at night two or three times to void. She thought she had lost some weight, but not more than a few pounds in 5 years.

The physical examination revealed that the patient was extremely well developed and well nourished for a woman of her years and displayed unusual physical activity and clearness of mind. The head was negative. The eyes reacted well to light and accommodation with only moderate arcus senilus. The teeth were in very poor condition, many being missing, and there was considerable oral sepsis. The neck and chest were practically negative although there was some evidence that the patient had had at one time a tuberculous process in the right apex, but without signs of recent activity. The abdomen revealed no masses and the liver and spleen were normal in size. There was no glandular enlargement apparent in the inguinal region or elsewhere in the body. There was moderate tenderness elicited just over the bladder, which was not distended during the examination. The extremities were negative and the reflexes were present without abnormality. Rectal examination revealed nothing of importance except a few hard, external hæmorrhoids.

Vaginal examination revealed what was first thought to be a large, ulcerated, cervical cancer which filled the entire introitus. Further examination revealed that this foul, ulcerating mass was firm, globular, measured about 4 by 4 by 3 centimeters, filled the external urinary meatus and extended upward along the posterior wall of the urethra about 3 centimeters. The vagina was absolutely free. The remainder of the examination revealed a senile uterus with normal cervix in good position.

Further questioning brought out that the patient thought she had had a small "warty" mass on the urinary meatus for several years. No evidence of cancer could be found elsewhere in the body, there being no enlargement of any of the palpable glands.

On successive examinations the urine was cloudy, with a specific gravity varying from 1014 to 1016. There was a marked trace of albumin but no sugar. Microscopic examination showed numerous leucocytes and red blood cells.

The blood examination showed:

Red cells	4,900,000
Leucocytes	5,440
Hæmoglobin	95 per cent

Differential count:

	per cent
Polymorphonuclears	64
Mononuclears, large	6
Mononuclears, small	29
Eosinophiles	1

Wassermann reaction was negative.

A tentative diagnosis or primary carcinoma of the urethra was made.

Under ether anæsthesia a more complete examination was made, which revealed nothing more. A small portion of the tissue was removed for laboratory pathological diagnosis and radium was applied. Five steel needles each containing 10 milligrams of radium element were inserted directly into the tumor at about equal intervals from each other and allowed to remain in position for 12 hours. In addition one tube containing 50 milligrams of radium element screened with 0.5 millimeters silver, 1 millimeter brass and 1 millimeter hard rubber was inserted into the urethral canal and allowed to remain for four hours. This made the total radium treatment 800 milligram hours.

The patient had only the usual postoperative and radium nausea and 2 days following the treatment was up and about without any unusual symptoms. Twelve days after the treatment the patient had suffered no tenesmus or other symptoms, and examination revealed that the mass was one-third less in size, was much cleaner and accompanied by considerably less discharge.

Pathological report No. 3032. A very small piece of rather friable tissue from the urethra. Microscopic sections show a surface covering of squamous epithelium. Directly beneath this are large masses of cells, some of which appear to be of the squamous-cell variety while others have a distinctly columnar or glandular type.

The whole is accompanied by considerable round cell infiltration. In some areas the picture suggests an epithelioma but without any epithelial pearls. On the whole the picture more strongly resembles a urethral caruncle which has begun to undergo carcinomatous proliferation.

The treatment of this important condition varies considerably, but, in general, thorough extirpation of the anterior portion of the urethra seems to be advised for the early cases. This can be done without sacrifice of the vesical sphincter. In some cases as cited by Kelly and Burnam (1) even the bladder may be sacrificed when necessary. There is a difference of opinion as to the necessity of the dissection of the inguinal glands. Kelly and Burnam advise this, while Crossen (4) points out that drainage by the lymphatics is to intrapelvic glands, hence inguinal dissection is unnecessary unless the operation is done for a wide-spread case. Crossen has devised an ingenious plastic resection of the urethra after primary drainage of the bladder through the vaginal wall.

X-ray has been reported as of value in the palliative and postoperative treatment of the disease.

It seems to us that radium, because of its accurate and easy application, offers a better chance for the well advanced case than operative interference.

Kelly and Burnam advise the use of radium following the operation as a guard against recurrence.

Our case being in a very elderly person and appearing to be extensive, although no definite evidence of lymphatic involvement could be made out, we thought to be best treated by radium, as this could be done without submitting the patient to the shock of a more or less extensive operation.

Fig. 3. Gross appearance of tumor protruding from introitus.

SUMMARY

1. Primary carcinoma of the female urethra is a rare disease, our case bringing the total reported in the literature to 69.

2. Urethral caruncle, although a relatively common affection of woman, may be followed by malignant degeneration, hence the importance of its early recognition and treatment.

3. Cancer in this location, although rare, should be recognized early and rigorous treatment instituted.

4. Treatment in the early cases consists of radical extirpation even to the extent of resection of the bladder, but this should be rarely necessary. In most cases the vesical sphincter can be saved in the operative procedure.

5. Radium should follow all operations and may be used alone in the well advanced cases.

NOTE.—Since this article was submitted for publication the following article has come to the notice of the authors, Le cancer de l'urètere chez la femme. Vernot and Parcelier. Rev. de chir., 1921, lix, 565. This is a report of 87 cases, including their own, giving a short summary of each case that they accepted and telling why some others were rejected. This is an excellent article, and should be read in the original by any one who is interested in the subject.

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THE THIERSCH GRAFT IN THE RADICAL CURE OF FRONTAL SINUS AND MAXILLARY ANTRUM DISEASES

Its Further Application to the Tonsil and Gingival Sulci[1]

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I AM pleased to present to you tonight three cases, one of frontal sinus suppuration, another of suppuration of the maxillary antrum with marked polypoid degeneration, and the third, repair of lower lip by a Thiersch graft and double tube pedicle. The frontal sinus operation was performed according to the method of Lothrop, and the technique of Denker was carried out in the case of the antrum, for the eradication of disease in these cavities, supplemented by the application of a Thiersch graft in one, two, or three pieces to the carefully dried surfaces of the entire cavity.

In the radical cure of frontal sinus or antral diseases it seems only reasonable to me, that the sinus surfaces which have been rendered bare, should be covered, preferably with a skin graft of the Thiersch variety, thereby *insuring* one of eradicating the disease, and leave a cavity which shall be free from future trouble. Dripping, weeks of irrigation, and the formation of scar tissue is avoided. I applied this principle to a gentleman over one year ago. He had had three external antrum operations covering a period of 5 years and had never been free from dripping. Since the procedure he has been entirely free from this distressing condition and the airway is free. Skin grafting of the frontal sinus and maxillary antrum has passed beyond the experimental stage as shown by the reports of Smith, Gillies, and myself. Its application to the tonsillar sulcus is still experimental. Probably before long, better methods will be evolved which will simplify the transplanting of skin to this cavity.

TECHNIQUE

The graft is cut, preferably from the right inner aspect of the thigh, to include the papillary layer of the corium and, if properly cut, only a slight amount of punctate bleeding ensues. It is placed upon a metal plate with its raw surface uppermost and evenly spread out. It is then covered with gauze wet in physiologic salt

Fig. 1. Lip sulcus rendered free from offending scar tissue by excision, with exposed bone of mandible.

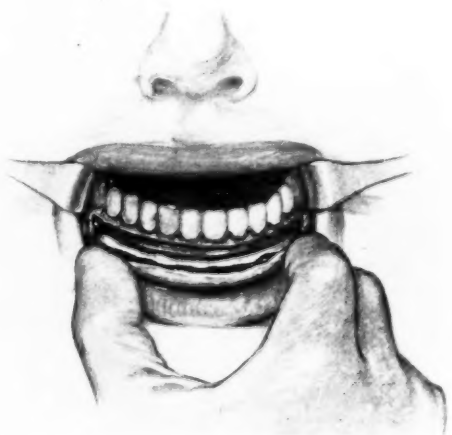

Fig. 2. Skin covered mold placed in lip sulcus.

[1]Delivered before the New York Academy of Medicine, December 21, 1921.

solution, until required to use in the area to be grafted. Four large pieces are taken to insure against a disaster. The sinus cavity is thoroughly freed of its diseased membrane, rendered dry by pressure sponging and the use of adrenalin chloride. The graft is inserted in the sinus cavity and placed over the intact anterior sinus wall. It is made adherent to the bone by the use of the Ballance catheter and then further spread over the vault of the sinus, brain plate, and exposed bone area of the newly made common nasofrontal duct. It is held in position by pledgets of cotton, by following the method used by Dench in skin grafting radical mastoid cavities. The method consists in using one or more small pledgets of cotton tied to long pieces of twisted silk and packed tightly in the cavity, the strands of silk thread being brought out through the nares. The pledgets are allowed to remain 5 or 6 days. The cavity is not irrigated as a rule until after the tenth day. If there is marked desquamation of the grafted surface and (sometimes there may be) especially at the junction of the overlapping grafts, due to epithelial overproduction, this scaling can be controlled by the application of sterile liquid alboline.

In the case of the antrum the same procedure is followed, except in using pledgets of cotton, one can use a small soft ballon with catheter attachment. This is inserted through the nose in the deflated state and after it is placed in position in the antrum, it is inflated to such a degree of tension as to assure even and firm pressure. After the sixth day it is deflated and removed. When using cotton pledgets with attached strands of silk I prefer to exit them through the gingival incision.

By allowing the external wound to remain open, one is able to determine, after removing the pledgets of cotton, how well the graft has

Fig. 3. Mattress sutures through tissues and tied to teeth, covering skin covered mold.

Fig. 4. Stent covered with a Thiersch graft in tonsil ulcus.

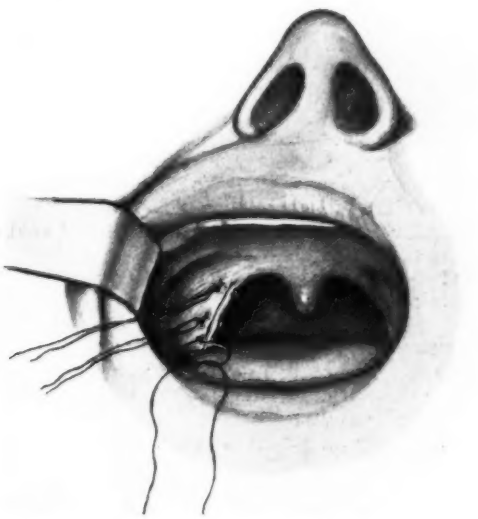

Fig. 5. Pillars of fauces sewn over skin covered mold with mattress sutures.

Fig. 6. Eradication of disease of frontal sinus after the method of Lothrop. Thiersch graft in position held in place by pledgets of cotton.

taken. In no case should the cavity be irrigated until after the tenth day.

In the third case the inside of the lip was grafted after the free excision of offending tissue. Epithelization of this new sulcus was obtained by the use of a skin graft wrapped around a suitable mold and sewed in.

The great advantage of grafting the tonsil sulcus after tonsillectomy is obvious, as it prevents cicatricial contraction and diminishes postoperative hæmorrhage. After the tonsil is removed, bleeding is controlled by one of several methods. Skin grafting of this new sulcus is obtained by making a mold of the cavity, the graft being applied to its surfaces, raw area outermost. The pillars of the fauces are sewn together by two or three mattress sutures over the skin-covered mold. The mold and sutures are removed after the fifth day. The throat is kept clean with gargles of saline.

Case 1. Frontal sinus disease, after operation. Application of a Thiersch graft to its bony surfaces. Mr. C. H., age 28, referred by Dr. A. C. Patient had suffered with pan-sinusitis for 15 years. Several intranasal operations had previously been performed by other surgeons.

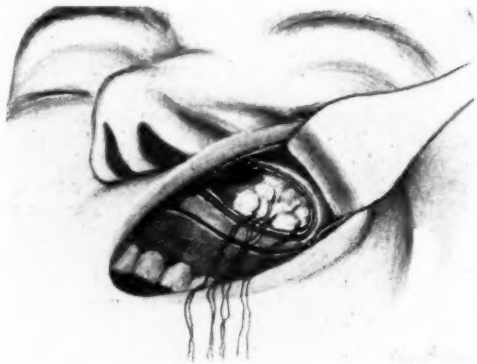

Fig. 7. Eradication of disease of antrum after the method of Denker. Thiersch graft covering bony surfaces with pledgets of cotton to keep the graft in place.

On September 28, under local anæsthesia, a secondary septum operation was done and both middle turbinates removed. The ethmoidal labyrinths and sphenoids were exenterated, the antra opened and drained.

On October 25, as the cervical glands were markedly enlarged and the tonsils diseased, they were removed, under local anæsthesia.

On November 10, polyps removed from left ethmoidal wall, under local anæsthesia.

On November 19, under general anæsthesia, a radical frontal sinus operation was performed according to the method of Lothrop. This was supplemented by the application of a skin graft of the Thiersch variety.

Condition at present, December 21, 1921: Headaches have passed: swelling of the cervical glands has subsided; mucous membrane lining bony surface replaced by skin as demonstrated by the use of nasopharyngoscope. The ethmoidal labyrinth is still weeping. The antra after daily irrigation are clear. Gained 6 pounds in weight.

Case 2. Morris D., age 29, suffered with left maxillary antrum suppuration with nauseating odor from nose. He had lost weight and appetite and was always tired.

On December 8, under local anæsthesia, operation was done. The cavity was full of polyps and very nauseating pus. Bleeding was controlled by pressure sponging and adrenalin chloride. Necrosis of the roof of the antrum. Method of Denker followed, supplemented by skin graft of the Thiersch variety.

Condition December 21, 1921: Marked reduction of nasal discharge. Mucous membrane lining antrum surface replaced by skin, as demonstrated by the use of the nasopharyngoscope.

Case 3. Mary D., age 21, referred by Dr. J. J. H., suffered a destruction of lower lip, chin, and loss of gingival sulcus. She had an ugly scarring of the right inner canthal region and the left side of face.

On October 8, 1919, a tube pedicle was made from right chest region. The offending scar tissue was removed and a new lip sulcus made. This whole cavity was lined with skin of a Thiersch variety. Two subsequent operations failed to repair chin and lip.

October 14, 1921. Left side of neck tubed.

November 14, 1921. Left tube to chin and lip, with stump of right tube to repair right angle of mouth.

Condition, December 21, 1921: Mouth lined with skin. Skin and lip repaired by still intact double tube pedicle.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D. ..... Managing Editor
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SEPTEMBER, 1922

"THE PARTY OF THE THIRD PART"

TRANSITION from the old to the modern scheme of medical education is a conspicuous achievement of two decades. During this brief period scientific medicine and medical schools have become a new thing in the world's pedagogic endeavor.

It is of interest to note that during these twenty years one-half of existing medical schools have been eliminated with a corresponding decrease of the student body. Expansion of plant equipment, general and departmental, has called for tremendous outlay on the part of institutions. Elaboration of curricula with its exaction for higher standards has created a demand for larger and better equipped teaching forces. Finally there must be noted the added years for undergraduate study and the increased per capita cost, which is conservatively estimated at from fifteen hundred to two thousand dollars a year per student. These facts are basic in our present régime and it is not strange that much concern is aroused on the part of administrators whose task it is to "carry on" and to make provision for future expansion.

Very recently in a spirit of perfect frankness there has come from sources high in authority a word of caution to the effect that in this modern scheme teachers seem to be losing their sense of proportion in an effort to do the impossible, the inference being that in the expansion of courses time is wasted upon what Hamerton calls "unsound accomplishments" at the expense of the real essentials.

Dr. Frank Billings assures us that "modern clinical medicine embraces such a vast field of knowledge that it is beyond the power of any individual to acquire the necessary learning, experience, and technical skill to practise efficiently in the entire field." This significant declaration is manifestly a confession as regards the apparent tendency toward specialization, against which there are numerous and earnest protests—added years of undergraduate work has encouraged heads of special departments, taking themselves rather too seriously, to magnify the importance of their subjects, as a part of the general curriculum, and with it there comes the demand that a proportionate number of hours be accorded to such instruction without regard for the aims or ideals of the individual student. These protestants insist that in many schools the tendency toward the pyramiding of specialties is inevitably productive of superficiality. As a result students too often are found to have acquired a smattering of disjointed knowledge with minimum facility in its application to their later and more serious tasks. Furthermore, the protestants against specialization proclaim loudly in behalf of the general public, "the party of

the third part" in whose interest, it must be borne in mind, all effort finally centers.

Beyond doubt there has been and always will be an imperative need for men of broad professional training, men well equipped as general practitioners, capable of filling the rôle of "the family doctor," who, though short on metabolism, are long on the humanities; in a word that type of men, who in addition to laboratory and technical training are capable of acquiring what Dr. William Pepper has defined as "the uncanny sense of diagnosis." This applies not only to the isolated, remote communities but to the more densely populated districts as represented by towns and cities of the fourth and fifth magnitude. There is a widespread belief that many capable young men, whose traditions are of the farm, the forest, the mountains, and the mines, after long years devoted to laboratory work, to refinements of diagnosis, and to the superficies of specialism, become hesitant at the end to return to the environment whence they sprung where they are badly needed and where they will find an open door to a successful career.

The result of all this, it is alleged, has been that many country districts have been left open to the inroads of the irregular and the charlatan. Doubtless this need is felt throughout our entire country from New England to California.

The abandonment of medical teaching by many reputable schools and several universities, notably Dartmouth and Bowdoin, because of inability to meet established requirements as Class A schools may in the long run become a matter of profound regret. Accepting this view of the present tendency, overcrowding of large cities and neglect of remote districts, one is led to inquire if we are not drifting unwittingly toward socialized medicine for it is inevitable that medical needs uncared for by the general profession will be assumed as governmental function. This principle once established will surely become universal.

It seems quite within the range of possibilities that sooner or later governing bodies and faculties of medical schools will seriously consider a revision of curricula to the end that more time and better facilities be apportioned to the teaching of what are to be regarded as the fundamentals, anatomy, pathology, general medicine, obstetrics, pediatrics, and surgery. Even the latter may be eliminated from this category, as it is very definitely one of the most highly developed of all specialties. Beyond question this would result in finer co-ordination and greater thoroughness in these branches. Under such a policy clearly defined provision could be made for adequate training in special branches under a post-graduate or extension course, whereby more thorough and exhaustive knowledge could be acquired by those who may elect one or more of these studies. It may be added that under this scheme there would accrue a tremendous saving of time and energy for those who look forward to a career in any given specialty.

THOMAS W. HUNTINGTON.

RETINITIS OF NEPHRITIS; ETIOLOGY

THE etiology of retinitis of nephritis has been a puzzling problem to internists and ophthalmologists for many years. Clinical studies supported by chemical and pathological data have been conducted but the conclusions have been so opposed that it cannot be said that the factors most prominent in the production of retinitis or the manner in which the fundus changes occur have been agreed on. The belief that changes

in the fundi of persons who have nephritis are induced by high blood pressure, arteriosclerosis, and serious impairment of renal function, and are varied in degree and kind according to the seriousness of these conditions, leads to the assumption that all three are intimately concerned; that is, any one may in itself be responsible for the appearance of changes in the retina. Such an assumption seems possible, since observations of selected cases of advanced retinitis show any one of these conditions prominent and the others absent, or present to a negligible degree.

Impairment of renal function, or decompensation of the kidney, usually precedes the appearance of changes in the fundus by a few days or a few weeks. Periods of kidney decompensation are often transitory so far as chemical tests on the blood and urine indicate, and may come and go without any visible changes in the retina at the time or shortly afterward. During a period of renal decompensation there is accumulation of toxic substances in the blood; these have been assumed to be primary elements in retinal damage, and although the exact nature of this damage was not explained, there seemed to be ample clinical evidence to support the assumption. Since it was known that the urea content of the blood increased, the retinal changes were said to be due to azotæmia. Mere absence of a kidney, or the presence of small, contracted kidneys, does not give rise to the grave toxæmia of even a short period of anuria or impaired function. Hence, on the basis of azotæmia, the retinal changes should be definitely related to the severity and duration of renal decompensation, whatever the pathological condition of the kidney may be, but we lack information on this point.

Indeed it is even denied by Schieck and Volhard that renal insufficiency, that is, toxic constituents of the blood, the result of low activity of the kidney, is a factor in the production of retinal changes. Basing conclusions on their observations they assert, unequivocally, that rise in blood pressure alone is the factor that produces these changes. Granting that both azotæmia and rise of blood pressure are definitely concerned in the production of the retinal changes, and the two theories are equally well supported, the combined effect of these two factors should bear a certain relationship, modified by a third factor, namely arteriosclerosis. Retinal hæmorrhages, œdema, and exudates are intimately concerned with the blood vessels of the fundus and observation of the walls of these vessels is fundamental in the study of retinitis of nephritis. Primary sclerosis of the retinal arteries without renal disease gives a picture closely resembling that found in nephritis combined with arteriosclerosis or hypertension, but on close observation it is seen to lack the elements that make the characteristic picture of renal disease. Sclerosis of the retinal arteries is found by all observers in a high percentage of cases of retinitis of nephritis, and its importance in the production of the characteristic features of the disease is quite generally accepted. The manner in which sclerosis modifies the œdema and hæmorrhages seen in the retina has not as yet been demonstrated, particularly in cases of hypertension. Primary sclerosis of the arteries may be followed by hypertension, as a result of sclerosis or a totally different condition, and secondary sclerosis from toxæmia or hypertension may be followed by atheroma or senile decadence; then, if renal decompensation with azotæmia arises, a triple combination in production of the retinal picture is presented. Azotæmia occurs without sclerosis and without retinitis, as does high blood pressure; arteriosclerosis may

occur without either azòtæmia or hypertension; retinitis is found with only one, any two, or all three of these factors.

The picture, then, must be composite, in which three possible etiological factors are at work at once, each modified to some extent by each.

Chemical study of the ocular fluids during azotæmia or high blood pressure may throw further light on the nature of the retinal changes. Determinations of intracranial pressure and intra-ocular tension should be made in different stages of the disease, because the retinitis that comes from choked disc is so nearly like the retinitis of nephritis that the difference is hard to explain.

The term "albuminuric retinitis" has served to indicate a large group of retinal pictures that are now known to have unrelated etiological backgrounds; some have nothing at all to do with albuminuria. It is well agreed that in no instance is the picture dependent on albuminuria. The term, then, should be avoided in the future and some other words, as "fundus changes in nephritis" or "retinitis of nephritis," be used. The objection has been raised that the changes that occur in the retina are not those of a true retinitis, but, in all probability, they are as truly inflammatory as are the changes in the kidney in chronic nephritis.

WILLIAM L. BENEDICT.

THE INFLUENCE OF ADIPOSITY ON SURGICAL RESULTS

SIR JAMES PAGET, in writing on senility in 1847, said that senescence is marked either by loss of quantity, as in the emaciation of old age, or by loss of quality, as in the obesity of advancing years. Obesity is closely associated with carbohydrate metabolism, and a considerable percentage of obese persons die from diabetes. The deleterious influence of adiposity on surgical mortality is very considerable. It is not alone a factor of anæsthesia, because there is an unexpected mortality following operations on obese persons when performed under local anæsthetics. Operations, no matter how trivial, should be considered seriously in the face of the obesity of the old, which must be regarded as a process of senility or degeneration, and, in the adiposity of the young and middle-aged, operations of expediency should not be lightly undertaken. Necessary operations, however, must be performed on the obese patient, and so far as possible, under local anæsthesia.

The greater number of necessary operations on obese patients are not emergency, and often a reduction in weight of 10 or 15 per cent will place the patient in excellent condition for operation, other things being equal. The reduction of weight before abdominal operation relieves the intra-abdominal tension; in the absence of infection, an obese patient thus prepared seldom dies from conditions that a person of ordinary weight would recover from. However, the weight should not be too greatly or too rapidly reduced, as debilitation may result. Methods for the reduction of weight are best carried out by an experienced internist who is interested in diabetes. It is sometimes advisable, if rapid reduction has been necessary, to give the patient a fairly full diet for several days immediately preceding operation.

WILLIAM J. MAYO.

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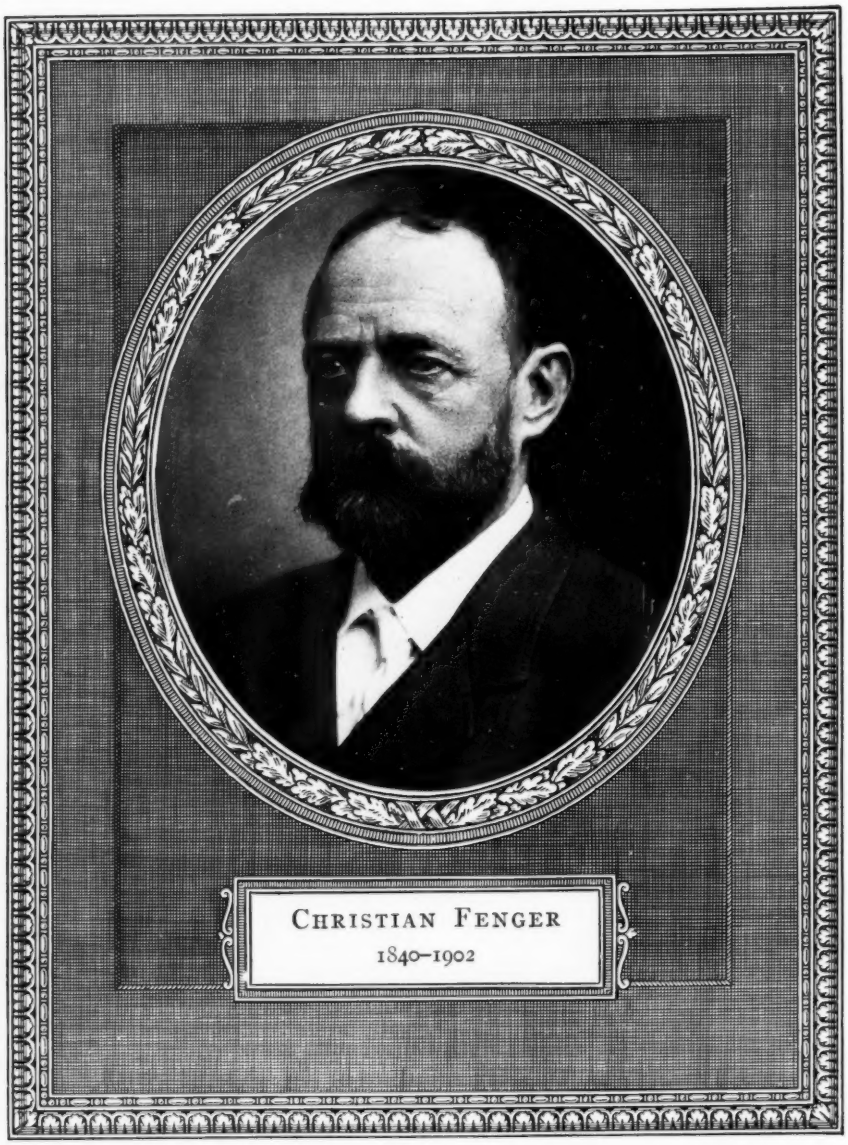

CHRISTIAN FENGER

1840–1902

MASTER SURGEONS OF AMERICA

CHRISTIAN FENGER

CHRISTIAN FENGER was born at Breininggaard Breinige Sogn, Denmark, November 3, 1840. He was one of twelve children born to Kammerrand Hans Fritz Fenger and Frederrike Mathilde Fjelstrup, both representatives of excellent families and well-to-do farmers. All of the sons secured excellent educational advantages, but with self-help. In 1851 the boy Christian Fenger entered the Herlufsholm school and graduated therefrom in 1859. He had a great love for the natural sciences and entered the Polyteknisk Läreanstalt, beginning the course in civil engineering. After one year his father induced him to take up the study of medicine. In 1860 he passed his first examination in anatomy, zoology, chemistry, and botany and soon thereafter passed an examination in philosophy, *cum laude*. He partly earned his way by teaching in the Melchior high school and by tutoring dental and medical students. During the war between Denmark and Prussia, he became an assistant surgeon at the Augustenborg Lazareth. In 1865 he again took up the study of medicine and in this year passed an examination to practice medicine. During the next 3 years he acted as an assistant to Dr. Villem Meyer in clinical otology and collaborated in the investigation of adenoid vegetations in the nasopharynx. In 1869 he was appointed interne in the Royal Frederik's Hospital for a two-year period. During this period he wrote a prize essay entitled "Concerning Subperiosteal Operations and Evidement," and also made fundamental experiments concerning gunshot wounds of horses at the Royal Veterinary College, and invented instruments for locating and extracting bullets from tissues. This experimental work was rewarded by a grant from the Royal Danish Ministry of War which enabled Fenger to take part in the Franco-German War. In January, 1871, he was appointed by Professor Socin, of Basel, to serve in the Red Cross International Ambulance and assigned to duty on the battlefield of Bourtaki-Werden (Haute-Saône). His experience in the war enabled him to write a report on the endoscopy of gunshot wounds. Immediately after the war he studied pathological anatomy and attended the surgical clinics at Vienna, and on his return to Denmark was appointed prosector to the Communehospital. In this position he continued until the end of 1874 during which time he took advantage of the splendid opportunities for investigation in pathology and morbid anatomy which was evidenced by the

important papers he completed on "Cancer of the Stomach," "Acute Hydronephrosis," "Gonorrhœal Rheumatism," "Endoscopy of Urethra," "Stenosis of Ostium Pulmonale," and others. The article on cancer of the stomach was written after painstaking investigation which included the explanation of the pain in cancer of the stomach as due to the involvement of the end-filaments of the pneumogastric nerve in the cancer mass. This was his thesis for the degree of Doctor of Medicine which was granted in 1874, approximately 13 years after beginning the study of medicine.

In the winter of 1874–5, he was appointed docent in pathological anatomy and became a candidate for the professorship of pathology upon the death of Professor Rasmussen. He was prepared to take part in the competition for this position, but the place was finally given to Professor Carl Lange by appointment. Fenger looked forward to an academic career in pathology and was disappointed that he was not permitted to compete for the place. However he accepted the situation philosophically and finally determined to make surgery his life's work, for which his long and extensive experience and investigation of morbid anatomy and pathology especially prepared him. He therefore decided to seek outside of Denmark the opportunities which would enable him to dedicate himself to surgery. In 1875 he went to Alexandria, Egypt, to assume the practice of his brother, Dr. Sophus Fenger, while the latter visited Denmark. On the return of his brother he located in Cairo where he resided with a friend, Dr. Bull. Here he secured a salaried position as *Médecin du Quartier de Kalifa*, under the chief of medical affairs in Cairo, Dr. Ahata Bey. In this position he investigated trachoma in the children of the public schools, and an epidemic disease of horses and mules which prevailed in Egypt following the war with Abyssinia in 1875. In 1876 he suffered from dysentery including an infection of the liver which interrupted the investigations he was making upon hæmatobium bilharzii. The winter of 1876–7 he spent in Mentone, France, and recovered his health. After his return to Cairo in the spring of 1877, the infection of the liver reappeared and he determined to seek a temperate climate. He had become acquainted with some American Army officers, among them Major Irgens, who persuaded Fenger to accompany him to Bloomington, Illinois. In June, 1877, he resigned his position with the Egyptian government and arrived in the United States in the fall of that year.

CAREER IN THE UNITED STATES

On a visit to Chicago soon after his arrival in the country, he was persuaded by his countryman and friend, Dr. S. J. Jacobson, to locate in Chicago. Dr. Jacobson introduced Fenger to the members of the staff of the Cook County Hospital and he was invited to conduct a few autopsies at that institution. His scientific demonstration of pathological anatomy created such an impression that Dr. Isaac N. Danforth, who held the appointment of pathologist to Cook County

Hospital, immediately tendered his resignation for the purpose of making the position available to Fenger. From the spring of 1878 until 1893, Fenger was the chief pathologist at the County Hospital; for 14 or 15 years the autopsy room at the County Hospital was the Mecca of medical students, internes and members of the medical profession of Chicago who for the first time in the medical history of the Middle West had an opportunity to witness scientifically conducted autopsies and to learn the fundamentals of morbid anatomy and pathology.

In 1879, Fenger served in the surgical wards for the various members of the surgical staff of the hospital when they were absent from the city on vacations. This surgical service gave him the opportunity to introduce Listerism—antiseptic surgery—in the Middle West. In 1880 Fenger secured appointment with a regular surgical service in the County Hospital in which he continued for the next 12 years.

From 1880 to 1884 he was curator of Rush Medical College Museum; in 1884 he was appointed professor of surgery in the College of Physicians and Surgeons; in 1893 he became professor of surgery in the Northwestern University Medical School, and in 1899 he became professor of surgery in Rush Medical College affiliated with the University of Chicago. He was surgeon in chief of the Passavant Memorial Hospital, the German Hospital of Chicago, and the Lutheran Tabitha Hospital from the time they were organized until his death. From 1893 to 1899 he was attending surgeon at the Mercy Hospital, Chicago, and from 1899 until his death, he was attending surgeon at the Presbyterian Hospital.

He was a member of the Chicago Medical Society, its president in 1901; the Chicago Surgical Society; the Illinois State Medical Association; the American Medical Association; and the American Surgical Association, its vice-president in 1895.

He was a prolific writer upon subjects relating to surgery, special pathology, and diagnosis. These papers were published under the joint editorship of Drs. L. Hektoen and C. G. Buford.[1]

Soon after he located in Chicago, Fenger married Caroline Sophie Abilgaard, who was born in Denmark and came to the United States with her parents when 5 years of age. This happy union was characterized by mutual, sympathetic understanding. Two children were born to them, a son, Frederick A., who graduated at Cornell University and qualified as a marine architect, and a daughter, Augusta Maria.

FENGER THE SCIENTIST AND MAN

In the foregoing the writer has given bare statements of the struggles for education, the professional positions held and other data of historical interest. The outstanding features presented are the evidences of the purposeful industry of the man. Undismayed by difficulties and obstructions to the attainment of

[1] The Collected Works of Christian Fenger. Philadelphia: W. B. Saunders & Co.

objectives, he won success in practically every project undertaken. His knowledge of morbid anatomy and of pathology was phenomenal for that day and was attained by unremitting energy during his life in Denmark and Egypt and his earlier experience in the United States. This knowledge of pathology and of morbid anatomy made him one of the great surgeons of his time. He never became a brilliant operator, but what he lacked in operating skill was more than compensated for by thoroughness and knowledge of pathology. In diagnosis he was unsurpassed by any of his living contemporaries. He spoke five or more modern languages, but did not possess a ready command of any language. Nevertheless, he was a great teacher and though his speech was usually marked by halting words, he was able to impart knowledge to others with greater clearness than most teachers with fluent speech. He was especially fond of young men who showed by their every day lives that they had a thirst for knowledge and expressed this by purposeful, enduring work. He spent hours of his valuable time, both of the day and night, in the instruction of young medical men; in these interesting conferences he frequently forgot the passage of time in the apparent joy of teaching. It was through his influence that many of the young medical men of the period from 1880 to 1900 visited the clinics of Germany, Austria, France, and England, and later became leaders in their chosen fields of work in the United States. While Fenger loved above every other thing in his professional life to help young men who were not afraid to work, he expressed an impatience with the frivolous and indolent men with whom he came in contact. Always he had the courage of his convictions and expressed them with blunt words which sometimes gave those unacquainted with him the idea of unfriendliness. But no man the writer has ever known was freer of envy or jealousy of others. Always he availed himself of every opportunity to express appreciation of the work of other men, provided it was characterized by honesty and efficiency. He was honest, intellectually and professionally. He was sincere and by nature simple in his deportment and daily life. He was free from cupidity and sympathetic with the poor; to each patient he applied all of the knowledge he possessed and all of the time necessary disregardful of financial reward.

Fenger lived in Chicago 24 years. During that period of time he exerted an influence in scientific medicine unequalled by any other individual. It was due to his influence and particularly as a pathologist that there developed such men as Nicholas Senn, John B. Murphy, William J. Mayo, Lewis L. McArthur, and many others celebrated as great surgeons, and Ludvig Hektoen, E. R. LeCount, H. G. Wells, and others recognized as great pathologists, and many practitioners of internal medicine throughout the Middle West and in Chicago. This splendid influence of Fenger was generally recognized as evidenced by the testimonial banquet tendered him by several hundred members of the profession, many of them from distant states on the sixtieth anniversary of his birth. The Fenger

Memorial Association, organized soon after his death, perpetuates his memory through scientific research carried on through the income of an endowment fund.

His home life was ideal and happy. Both he and Mrs. Fenger loved art, music and literature, and the society of cultured friends. Christian Fenger passed from this life on March 7, 1902, but though 20 years have passed, he lives today in the hearts and minds of hundreds of physicians and surgeons who were proud to call him master; and he will continue to live through other generations by the work of his students and his pupils' students.

FRANK BILLINGS.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD APRIL 7, 1922, DR. DEAN D. LEWIS, PRESIDING

AUTOGENOUS VERSUS HETEROGENOUS BONE PEGS

DR. GEORGE DE TARNOWSKY read a paper entitled: "Autogenous Versus Heterogenous Bone Pegs." (See p. 342.)

DISCUSSION

DR. CHARLES DAVISON: It seems to me that it has been satisfactorily proven, both experimentally and clinically, that autogenous bone transplants, when properly placed are not treated as foreign bodies by the tissues and that they maintain sufficient viability to graft to the adjacent bone and become a part of it. The use of autogenous bone for transplantation has its objection in the fact that it robs the patient of bone from some other location.

I saw some of Dr. Tarnowsky's work at Cook County Hospital. I tried to follow up the cases after they left the hospital, but was not able to keep in touch with them.

At the University of Illinois College of Medicine we have been doing experimental work on a series of dogs to try out the use of boiled beef-bone transplants placed in the medullary canal of the humerus after fracture. We used young dogs. We used the same operating room surroundings and technique as used for human patients. The dogs were killed at different periods after operation, up to about 450 days, for comparison of the processes of repair. Roentgenograms were systematically taken. Notwithstanding our extreme care, the infections were many and practically every dog that became infected died. The dogs that lived to be sacrificed showed an average condition at different periods as follows:

1. The transplant was held in position in both fragments by new bone between the endosteum and the transplant, resembling the new bone found around the edge of a Lane plate, but there was no callus uniting the ends of the fragments. The fracture was only supported by the beef-bone transplant.

2. The transplant was entirely disintegrated between the ends of the fragments of the fractured bone—freeing them from the mechanical immobilization of the beef-bone transplant.

3. Fibrous union of the fragments was usually in poor condition.

4. Bony union of the fragments in mal-position took place at a very late date with poor function.

We are still working at the problem and hope to present a more complete report at a later date.

DR. H. M. RICHTER: I feel that Dr. Tarnowsky's opening remarks necessitate my saying a word. I hesitate to do so, but I desire to place this matter on a definite chronological basis.

December 10, 1914, I operated on a fractured femur at Mt. Sinai Hospital, after being unable to reduce it in any other way, and put in a beef-bone dowel. Dr. Schrager assisted in the operation. A few weeks later, at the Cook County Hospital, I operated on a fracture of the femur, again using a beef-bone dowel. During the period of 7 years that has elapsed since then, I have used the beef-bone dowel on several fractures of the femur. During the operation on the second case, Dr. Tarnowsky was present and asked me whether it was original work, and he suggested that my work should be published. I have reminded Dr. Tarnowsky that four of his original six cases came in on my service and were placed at his disposal as a matter of courtesy.

In 1915, after I had done my first two cases, one of Lexer's assistants at the Jena clinic came out with an article on the use of horn as a means of fixing joints in Lexer's arthroplasties. I secured a number of beef and ram's horns at the time, worked with them and made dowels of them. We had a motor machine to do the work. We made a number of dowels of different sizes and compared them with the bone dowels. They had some advantages over bone dowels. They were said to be more rapidly absorbed, and because of their epithelial structure, I should judge they would be.

I feel that heterogenous materials, bone, ivory, horn, or what not, should have as their purpose one thing, and that is, fixation of the fragments long enough to get union; that they need not last longer than a few weeks. They are objectionable if they interfere with union. Horn can be more readily used. It is much easier to cut. One can cut it with a knife when hot, or with bone-cutting forceps. It has an advantage over bone. It has the disadvantage of not being accessible to all of us. We can get beef bone more easily.

DR. D. B. PHEMISTER: I understand that Drs. Tarnowsky and Richter believe that all of the living autogenous transplant undergoes necrosis. No one who has worked histologically on the problem in recent years agrees with this view, the general opinion being that unossified osteogenetic elements sur-

vive, if favorably placed for reception of nutrition, proliferate, and participate in the establishment of union and transformation in the compact portion of the transplant which undergoes necrosis. If an entire bone, as a metatarsal or metacarpal, is excised and reinserted, it takes, and in 3 months you can scarcely tell that it has ever been excised. If, however, it is boiled before reinsertion, infection very frequently develops about it and the wound frequently opens up; if not, the boiled transplant is gradually absorbed.

When fragment ends are adequately apposed and fixation alone is required, beef bone or ivory may act quite as satisfactorily as a living graft, but if there is defective osteogenesis or bony gap to be bridged, a living transplant should always be used.

In cases of non-union with marked atrophy, I have used with success a heavy graft which is inlaid and fills out the medullary canal and grooves in the cortex and stands above the surface of the bone for a considerable distance. This gives fixation by a heavy graft which will not break and which has a good chance to take.

Dr. Kellogg Speed: I have operated on three fractured femurs attempting to obtain a repair by means of beef-bone implants or intramedullary transplants. Two were successes, and one was a failure. None was infected. One patient was a young girl who had a fracture of both femora. One femur failed to unite and the other side succeeded, both were without infection. Why this was I do not know.

Recently I have operated upon a patient who had a fracture of both bones of the forearm, which was formerly treated by one of the fellows of this society in which he transplanted in the medullary cavity of the forearm bones, ram's horn or beef horn. This was followed by non-union in both bones but no sepsis. An X-ray picture of the ram's horn, taken many months after the original implantation, showed no change, no absorption. It retained its square edges and apparently had undergone very little absorption after 6 months. There was non-union and fibrosis covered over the fragments. I believe beef bone has a use. I believe live bone transplants will live and regenerate, especially the unossified elements which are supplied with sustenance. There are occasions when one wants to use beef bone, when the patient is too young, or for any other reason when it is impossible to take out his own bone and use it as in extensive or multiple operations where haste is a factor. The prolongation of the operation which may cause shock is inadvisable. Beef bone is applicable to that type of case. It is used, however, only as a fixation agent, and if one drives the transplant into the intramedullary cavity and plugs that cavity, non-union may follow. For that reason I have given up the intramedullary transplant altogether. I never use it any more. I employ the inlay method or one similar to it, using live bone. I think the time will come when the insertion of live or dead bone into the intramedullary cavity will be abandoned.

Dr. Dennis W. Crile: Dr. Barney Brooks, of St. Louis, has shown that the live bone transplant lives, and that it lives to produce new bone. He discovered a vital stain which stains only growing bone, and by means of its use has been able to demonstrate that autogenous grafts live. Based upon his experiments, he has devised a two-stage operation by which he increases the viability of the graft. At a first operation, he cuts the sides of the graft, leaving the ends and medullary connections intact. Small blood vessels and granulation tissue appear during the subsequent 2 weeks or 3 weeks, so that when the graft is finally transplanted at the second stage of the operation, it is actually in the process of producing new callus, and in prime condition to reestablish its intrinsic nutritional blood supply *via* the new and soft capillaries of its granulations. It is obviously impossible for the boiled graft to assume this function which should prove valuable in the treatment of a group of selected cases in which the osteogenetic function has been found deficient.

Dr. Dean Lewis: I have had occasion to verify the work of Dr. Brooks, which has been referred to by Dr. Crile. The first case I had was a man who had had arthritis of the knee for 9 years. He had been operated on three times. I operated on him a fourth time. When I saw the case a week after the operation I found that the intramedullary graft had slipped—had come out of the upper fragment—and I put on a cast and sent him home. He came back 14 months after that without union. I operated at that time using an intramedullary peg, as the lower fragment was solidly fixed. I chipped off the upper end because it was not in contact with the upper fragment, and found there live bone cells. In the cortex of that graft were live cells which replaced some of the dead bone. This graft was placed in the marrow cavity, as Dr. Brooks suggested, and a small Lane plate put on. That patient has had union for 6 years. I have had other cases in which infection occurred and the transplant broke or a sequestrum broke. I cannot understand why surgeons overlook the fact that sequestration is apt to occur after a transplantation. I have seen sequestration repeatedly following infection. Dead bone will form sequestra. The transplant forms a sequestrum with live bone about it. In my case the sequestrum was taken from the upper fragment but there was firm union in the lower fragment. I chipped off a piece and forced the graft back in place and the man secured firm union.

What Dr. Brooks has demonstrated experimentally has been verified clinically. A transplant in position offers one of the best prospects of cure for fractures. I am certain that sequestrum formation after infection of the transplant is a very common occurrence.

Dr. George de Tarnowsky (closing): I have heard repeatedly of Dr. Davison's experiments on dogs. We all appreciate the fact that dogs become infected very readily, and that there will always be a large number of infections in bone surgery on dogs or cats.

In spite of the arguments that have been advanced against heterogenous bone pegs and in favor of living bone transplants, I feel just as much convinced as before I read my paper, that both living transplants and dead bone pegs are foreign bodies when introduced into the intramedullary cavity or as inlays. A bone transplant cannot be taken from one part of the body, completely disconnected from its nerve and blood supply, and transplanted to some other part of the body and remain a living entity. Ultimately it is to be hoped that this question will be settled.

Dr. Lewis said that a sequestrum cannot form except in the presence of living bone. I do not know how he can explain the particular case I have referred to, in which, after 7 years a distinct sequestrum shows. I made use of beef bone in this case and it was certainly dead when transplanted. It has eburnated. It has not been absorbed for years.

I agree with Dr. Richter that we must not displace bone marrow any more than we can possibly help. We must not hammer the peg in tightly. That is a mistake. I put in two or three screws or ivory nails to hold the bone peg in place, and even then the implanted pegs may slip, and in spite of the fact that the limb is immobilized you may find that in some way the pegs have slipped an inch or an inch and a half up or down. I have no explanation for that, but in order to insure against slipping I advise putting in one screw proximally and distally. The peg must come in firm contact with the living and freshened bone, both proximally and distally.

Regarding the utility of using heterogenous beef bone for the filling in of defects, I will say that British surgeons have reported a number of successful cases, where from 4 to 10 centimeters have been filled in with heterogenous beef-bone peg.

I hope in a few years we will take this matter up again and possibly come to some understanding.

Dr. Albert H. Montgomery read a paper on "Gastrojejunal Ulcers."

ASSOCIATED PATHOLOGY OF GALL-BLADDER DISEASE WITH A FURTHER PLEA FOR CHOLECYSTECTOMY

Dr. Frank D. Moore read a paper entitled "Associated Pathology of Gall-Bladder Disease with a Further Plea for Cholecystectomy." (See p. 338.)

DISCUSSION

Dr. William M. Harsha: Dr. Moore has certainly given us a wide field to consider in connection with gall-bladder pathology. It is hard for one to think about the subject in terms of such numerous pathological conditions as he has described; yet when you analyze it, there is probably no exaggeration. The early pathology of the gall bladder is one of the things that is most difficult to determine. That has been my experience. Even when we have the abdomen open we are often unable to tell whether the gall bladder is diseased. Sometimes cultures have shown infection when there was no macroscopic appearance of any sort to indicate operation, so that while the subject has been written on a great deal of late it is yet far from settled and is deserving of very close study. Our greatest need is to settle on some satisfactory method or methods of determining when we have a pathological gall bladder. The procedure of Lyon while promising, I do not believe has been generally adopted. I believe it worthy of a thorough trial. A careful history and a careful physical examination, if we can eliminate the hyperæsthesia of the neurotic individual, continue to be our chief reliance, i.e., the clinical history and physical findings.

The X-ray gives us little, if anything, of importance on the earlier pathology of the gall bladder. It helps us to exclude ulcer, gastric or duodenal, but it helps us little in determining positively any pathology of the gall bladder.

As to the desirability of taking out the gall bladder or draining it, there is a great diversity of opinion. Some very good authorities, like Willis, of Richmond, advocate a drainage operation in advanced pathological conditions of the gall bladder, because of the danger to life, and cholecystectomy when we have very slight pathology because of the danger from adhesions following drainage. I do not agree that the subsequent troubles from adhesions are so formidable as most writers claim. I believe that with careful handling, and with a snug suture of the gall bladder properly placed around the tube, we do not usually have formidable adhesions.

With advanced pathology, where the lymphatics are involved, and where there is hepatitis or cholangeitis, drainage is much safer, and is attended with less mortality. We know that in infections of the extremities, with abscess formation, the lymphatics are involved, yet with drainage they resolve and disappear without amputation, so that I believe that those of us who have been using drainage of the gall bladder in the past, with the view of cleaning up the tracts have justification for that practice. I believe in many cases drainage of 3 or 4 weeks will clear up lymphangitis, cholangeitis, the liver will assume its normal function, the lymphatics will clear up, and we will have an organ left that has some function. I think it is fairly well agreed that the function of the gall bladder is to store and concentrate the bile. Bile coming out of the cystic duct is entirely different from that coming from the hepatic duct. To practice total ablation of gall bladders, whether slightly diseased or which may not be diseased at all, is certainly not best for the patient.

Personally, I would rather have an adhesion than to have my gall bladder taken out for a very slight pathology. If it can be done safely, I think cholecystectomy is necessary in many cases where the walls of the gall bladder are clearly diseased, thick, or of the strawberry type. However, I do not approve of the widespread tendency to make cholecystectomy the operation of choice. The decision should be made by the surgeon at the operation.

DR. JOHN R. HARGAR: From the reading of this subject and hearing it discussed, it is very easy for one to draw the conclusion that the question is far from being settled. We all agree that pathology in the upper abdomen is frequently associated with the gall bladder, and it is quite likely that the gall-bladder trouble is at times secondary to appendix trouble, and we know a great many cases are secondary to a gall bladder condition. However, it seems rather radical to talk about removing such a large percentage of gall bladders.

Dr. Harsha has well said that the diagnosis in the early stages of gall-bladder conditions is not easy. Individuals so frequently suffer more or less from gall-bladder conditions and a diagnosis is not made. In this connection we might use the analogy of a joint cavity or the urinary bladder. An acute synovitis is capable of clearing up and returning to a normal condition even in the event of suppuration of the joint. After drainage we get apparently a normal joint. So in the urinary bladder where there is natural drainage we get, after all types of inflammation of that bladder, a return to a practically normal condition. In contradistinction to that, one of our best genito-urinary men made this statement a year or two ago, namely, that he firmly believes that when the urinary tract is chronically infected, it is always infected; and that it never does clear up entirely. A great many cases light up from time to time after various predisposing factors are manifest.

One of our men said here a few months ago in discussing this subject, it would seem absurd to remove the urinary bladder because it was full of stones or was inflamed. Furthermore, in the case of a joint, if the infection is limited to the synovial membrane, the joint frequently returns to a normal condition. And so it may be with the gall bladder, if the inflammation is slight, it will return to a normal condition. With an infection about the joint cavity, in the periarticular tissues, the joint is prone not to return to a normal condition but the pathological process is apt to remain indefinitely. If we can picture a gall bladder in the same condition with the infection in the wall of the gall bladder, it thus becomes chronic, and the gall bladder will not return to a normal condition. Before we consider the removal of the gall bladder, we must discuss this question, namely, pancreatitis, which is frequently associated with cholecystitis. We were taught a few years ago that the treatment of acute pancreatitis consisted of drainage of the gall bladder. If the gall bladder is removed, what assurance have we that the individual will not develop acute pancreatitis from the gall tracts? The gall-bladder trouble is not necessarily the cause of pancreatitis but it seems logical to suppose that an acute cholangeitis may be associated with an acute pancreatitis. If we have an acute pancreatitis with the gall bladder removed, we would be in a peculiar position. True enough, a gall bladder that is the seat of an old inflammation and contains gall stones, or is of the thickened or strawberry type, should be removed. When I think of this question I think of an instance which occurred a few years ago when I sat on the benches as a medical student and listened to the pathologist discussing a postmortem examination. I cannot recall the instance where the peculiar pathology he was discussing obtained, but he said this: "It may and it may not, then again it might." I think oftentimes when we are going to operate on the gall bladder, we think that same way, we may remove this organ or we may not, and then again we might. I believe the removal of the gall bladder depends entirely on a man's surgical judgment. Good surgical judgment is the thing to use in these cases. There are many cases in which the gall bladder should not be removed, and there are many others in which it should be removed, and if a man can depend on his surgical judgment when in the abdomen to treat these gall bladders by drainage or removal, it is a safe and sound method.

DR. MOORE (closing): I agree with Dr. Harsha that it is very essential and sometimes very difficult to make a diagnosis, but I believe that by a closer observation of the clinical history in these cases we will be able to do so.

In regard to drainage, I am of the opinion that in most cases we drain only the surface without relieving the deeper or interstitial layers, and a gall bladder that has been drained in this way from 6 weeks to 3 months can never return to normal function whatever that may be, whether it be that of a reservoir or as a pressure-gauge regulating the flow of bile into the intestine.

We have all seen in secondary operations nothing left but useless tracts or pathological remnants and nothing like a normal gall bladder.

With regard to pathology, the object of my paper is to emphasize the importance of early diagnosis and of early operation to prevent secondary pathology. When the gall bladder is once infected, I think it should be removed.

BOOK REVIEWS

CRITIQUE OF NEW BOOKS IN SURGERY

ALTHOUGH essentially an atlas the first four chapters of *The Pathological Gall Bladder*[1] are devoted to a general discussion of roentgenography in gall-bladder disease whether or not calculi are present. The authors' technique is given in detail; the basis for interpreting the results is concisely stated, and a statistical report given which shows about 88 per cent of correct inferences in the last 128 operated cases.

Both the technique and the interpretation in this work must be especially skillful since the shadows produced are of the most delicate sort. A thoroughgoing technique may require more than a dozen exposures before films of a quality adequate for diagnosis are obtained. Particularly is this true when attempting to make inference regarding a diseased gall bladder in which no lime-containing stones are present. The technique is primarily roentgenographic for it has been found that the fluoroscopic screen is of use only in the detection of signs of pressure of the gall bladder on neighboring barium-filled viscera.

The body of the atlas is divided into three sections as follows: I. Pathologic Gall Bladders Containing Stones; II. The Visible Pathologic Gall Bladder; III. The Pathological Gall Bladder: Indirect Evidence.

This contains every conceivable variation in the structures of the right upper quadrant seen in gall-bladder disease. The authors' contention regarding the visibility of the diseased gall bladder is well vindicated. Nowhere is to be seen the rich array of roentgenographic material on this subject. To one who is seeking to follow up this work in which the authors are pioneers, the atlas is invaluable for comparison and reference. While no attempt is made to give a brief of the clinical history of the cases illustrated, as a purely roentgenographic production, the atlas is without parallel.

Aside from the content, the atlas is a masterpiece of bookmaking. Laid out lavishly and finished to perfection, there is left nothing to the imagination in illustrating the authors' points. Considering the delicate structures dealt with, it is nothing short of marvelous how well these structures are shown in half tone and photographic copies. The description of the plates is in English, French, and Spanish.

HOLLIS E. POTTER.

[1] The Pathological Gall Bladder Roentgenographically Considered. By Arial W. George, M.D., and Ralph D. Leonard, M.D. New York: Paul B. Hoeber, 1922.

THE second edition of this excellent work[1] shows many minor changes, few topics having escaped revision in some particulars. Certain chapters have been enlarged and new references and data collected since the first edition went to press have been added. Chapters on tumors of bone and on neurofibromatosis have been rewritten in large part, the changes made being such as would come with a review of such a comprehensive subject in the brief period of two years. Emphasis and space continue to be given to a delineation of varieties in tumor development, to tracing the mode of neoplastic origin and growth, and to distinguishing the different forms and situations of growths of the same general variety. Essentially the volume is the work of a pathologist, yet so arranged and with the subject matter so presented as to be of pre-eminent service to the clinician. It were platitudinous to say that this work will become a classic, but today it forms the most thorough and informing treatise on neoplasms in our language. CAREY CULBERTSON.

THIS interesting monograph[2] is a critical and suggestive résumé of the author's work on the gastro-intestinal tract which has been reported during the past few years in the *American Journal of Physiology* and other journals. According to his conception the most important factors in controlling the movement of intestinal contents are, first, the inherent property of smooth muscle to undergo rhythmic contractions and, second, a gradation in the strength of those contractions from the upper to the lower end of the digestive tract. Various extrinsic influences may start up and augment these normal contractions; for example, stretching from the pressure of food or gas, irritation from inflammatory conditions, and chemical irritation from drugs.

The author emphasizes the fact that although the muscular wall of the gastro-intestinal tract consists entirely of smooth muscle, there are great differences between the musculature in different parts of the tract, depending on the different requirements put upon it. For example, the muscle of the cardiac end of the stomach is soft "like coagulated fibrin; that in the pyloric antrum is tough like

[1] Neoplastic Diseases; a Treatise on Tumors. 2d. ed. By James Ewing, M.D., Sc. D. Philadelphia and London: W. B. Saunders Company, 1922.

[2] THE MECHANICS OF THE DIGESTIVE TRACT. Walter C. Alvarez, M.D. New York: Paul B. Hoeber, 1922.

gizzard." If the two are stimulated they show a different contraction curve, and in Locke's solution they show different types of rhythmic activity. There are also different types of peristaltic activity in the stomach. For example, there are normal waves of contraction starting as shallow ripples near the cardia and breaking into deep waves at the antrum, hunger contractions during the first stages of starvation, etc. In the small bowel there are rhythmic movements which move the intestinal content back and forth from one end of a short loop to the other, without forwarding it along the bowel. The forwarding is done by peristaltic rushes which usually arise in the duodenum, perhaps as very shallow ripples, and increase in intensity from above downward. These rush waves are stopped by active contractions which arise in the region of the iliocæcal valve. In the colon the muscle is sluggish and contraction waves appear only at long intervals. Reverse peristalsis may appear in any part of the tract, but is usually the result of irritation or disease.

The rhythmic contractions of the smooth muscle, which form the essential element in these different types of muscular activity, show a definite gradation from the upper to the lower part of the tract. This depends upon a similar gradient in the metabolic rate, as shown experimentally by a determination of the carbon dioxide output and the oxygen consumption of the muscle in different parts of the tract. The author believes there are similar gradients in the catalase content of the tissues, in the muscle tone, and in its irritability.

Theoretically, any condition that would tend to disturb the normal gradient would lead to some sort of intestinal upset. For example, trauma, inflammation and ulceration raise the metabolic rate, the rate of rhythmic contraction, the irritability and tone in the affected region. The result is a sharp peak in the gradient instead of a uniform ascent or descent. Toxins of various sorts depress the gradient, possibly more in some parts than in others. Drugs may raise or depress the gradient, and may act differently in different parts of the bowel. These conditions manifest themselves by various symptoms — slowing of the intestinal current resulting in distention and constipation; acceleration of the current causing diarrhœa; reversal of the current with belching, nausea, vomiting, etc. In the case of a diseased appendix, the muscular contraction in the region of the appendix would be increased in rate and in force. Theoretically, waves of contraction would be initiated from this point, and lead to reverse peristalsis above the lesion with nausea and vomiting, and to hyperactive peristalsis below with diarrhœa. Actually such is often the case.

To describe the physiology of the different portions of the intestinal tract and their behavior under various abnormal influences as set forth in this monograph, would unduly prolong a brief review. The author fittingly says the value of a theory depends on its ability to explain and find a place for new facts, and the reader, I feel, will agree that Alvarez's conception of the physiology of the gastro-intestinal tract is helpful, suggestive, and of interest and value to every one interested in the basic problems of nutrition, digestion, and gastro-intestinal physiology. SUMNER L. KOCH.

CORRESPONDENCE

PRACTICAL METHOD OF FIXATION IN FRACTURES OF THE MANDIBLE

To the Editor: I feel that a word of explanation is necessary in regard to my paper in the May issue of SURGERY, GYNECOLOGY AND OBSTETRICS, on "Treatment of Fractures of the Mandible," which may appear to give credit for originating a principle of treatment to those who are not entitled to it and who I am sure would not for one moment claim this originality. The *principle* in question is that of fixation of the fracture of the mandible by means of wire ligatures passed from the upper to the lower teeth. Credit for this unquestionably belongs to Dr. Thomas L. Gilmer, of Chicago, who first pointed out its value in *Archives of Dentistry*, September, 1887. All methods subsequently published, including the one described in my article, in which this principle is utilized, are but modifications of the method of Gilmer.

ROBERT H. IVY.

Philadelphia.

AMERICAN COLLEGE OF SURGEONS

MEXICO

By WILLIAM J. MAYO, M.D., F.A.C.S., Rochester, Minnesota

THE distance to the City of Mexico from the cities east of the Mississippi River equals that to southern California and the time required to make the two journeys is approximately the same. While San Antonio is 150 miles north of the Border, this is the city rather than Laredo on the Border from which one starts the journey into the country of our southern neighbor. San Antonio is a beautiful city, progressive, and up to date, with nearly 200,000 inhabitants. Its medical profession is of the best, its newspapers are of unusual strength, and its public spirit is shown strikingly in the beautiful parks that make it one of the most attractive of American cities. Remarkable architectural evidences of the old Spanish occupation are close at hand. The Alamo, of historic fame, is a well-preserved ruin of the Franciscan mission, built in 1772, in which in 1836, a group of 183 Americans to the last man died at their posts when besieged for 13 days by General Santa Anna's Mexican army. Among these gallant defenders were Colonel James Bowie, whose name is perpetuated by a remarkable hunting knife which let the light of day into much human anatomy in frontier times, and David Crockett, the bold scout, loved in our boyhood days, and characterized by his slogan, "Be sure you are right, before you blaze away," which might well face the surgeon from the wall of the surgical amphitheater.

On crossing the Rio Grande River, one enters a truly foreign country and an ancient civilization. The contour of the land changes, rising gradually to the great central plateau of Mexico, in the northern part of which is situated the city of Monterey. On the line of the railroad near Monterey was fought the battle of Buena Vista, the most brilliant engagement in the war with Mexico of 1845, and one of the most brilliantly fought battles in all history. Here General Zachary Taylor with less than 5,000 men, fighting against terrible odds, strategically defeated General Santa Anna with more than 20,000 men. Taylor's army was on the defensive between two mountains, his left on the mountain side, his right in a series of arroyos cut by flood waters. Santa Anna's troops rushed down on the right and were brought to confusion by the arroyos, which, like the sunken road at Waterloo, brought victory from what seemed certain defeat.

Pullman service beyond the Border is good and the journey to Mexico City is made very comfortably. The city is beautiful; it has with its suburbs 1,000,000 inhabitants, and it lies in the center of a well-watered valley more than 7,000 feet above sea level. Mexico City is to Mexico what Paris is to France, and as the capitol city of the Mexican Federal District, what Washington is to the United States. Guadalajara, with about the elevation and population of Denver, is the second city in Mexico. It also lies in a valley of great richness; its climate varies only a few degrees during the entire year. The rainy season in this part of the country begins in June and ends in September, the downpour coming at about the same time each afternoon. The third city of Mexico, Puebla, is beautiful, and very attractive to tourists.

The Mexicans are our nearest neighbors on the south. We should live with them as understandingly and as peaceably as with our Canadian friends on the north, but there are many reasons why this has been difficult. Canadians and Americans are essentially the same people with the same historical Anglo-Saxon background. The Mexicans' civilization is Latin, and the basis of the population, Indian.

HISTORICAL

As an aid in understanding the nature of these difficulties and the manner of overcoming them, historical events should be recalled. Mexico, as a state under Spanish rule, antedates the oldest settlement of the French and English in the New World. The conquest of the empire of the Aztecs in 1520, by the brave and hardy Spanish buccaneer, Cortez, followed closely the discovery

of America. The vice-regal government established by Charles V of Spain flourished for a time and at the middle of the sixteenth century was the most important dominion of the white race west of the Atlantic. In the interval between 1520 and 1821, sixty-four Spanish viceroys, only one of whom was born in America, ruled in succession in the ancient capitol which Cortez had wrested from Montezuma. During this period three classes of people, quite distinct in character, appeared as subjects of the Mexican viceroyalty; Spaniards, Indians, and mixtures of the two. Such was the condition of Mexican society at the beginning of the nineteenth century, when the revolutionary movements in Europe gave rise to a revolution in Mexico, headed by Miguel Hidalgo. Hidalgo, the son of a farmer, was born in 1753. He was educated and ordained for the church, serving as curate in several places. Hidalgo was intellectual; his opinions on all subjects were in advance of the period, and he was the first to conceive the idea of an independent Mexico, not a helpless dependency of deteriorating Spain. Under his leadership, (1810–1811), a movement for independence, the Grito de Dolores, was started, which was not to die. Hidalgo was eventually vanquished by the royalist forces, and with his lieutenants, Allende, Aldama, and Jiminez, was executed July 31, 1811. This ended the first period of the struggle for independence in Mexico. Hidalgo's struggle for independence was continued by José M. Morelos, who, until the age of 30, was a muleteer. He was then made a curate, and later, like Hidalgo, became a general without taint of personal ambition. He led the independent troops from victory to victory, to be defeated by the royalists and condemned to death in 1815. This closed the so-called second period of Mexican independence. If the revolutionary leaders who followed him have not always been true to the example of his unselfish devotion to the cause, the mass of the population has never wavered in devotion to his memory. After the death of Morelos, the independent troops were headed by General Yturbide, who was able but actuated by selfish motives, and in 1822 the Treaty of Cordova establishing the provisional independence of Mexico was concerted by him and O'Donoju, the sixty-fourth viceroy.

Such movements, however, do not fundamentally change the character of a people. The republican system which was established on the ruins of the viceroyalty was stormier even than the government which it replaced. For about half a century after the revolution there was little progress toward the establishment of a permanent and orderly administration. In 1835, the confederacy of states was changed into a consolidated republic, of which Santa Anna was the nominal president and virtual dictator. For the next 20 years, through a series of turbulent revolutions, he was by turns chief, exile, and captive. In the meantime, in 1836, Texas declared and successfully maintained its independence, and 9 years later, in 1845, was admitted into the American union. A dispute concerning the Texas boundary brought on war with the United States, at the conclusion of which, Mexico ceded to the United States the territory north of the Rio Grande. Santa Anna, who had led the Mexican forces in the decisive struggle, was finally deposed in 1855. In 1858, the able and patriotic Benito Juarez gained the presidency. He instituted a course of vigorous reforms, including the separation of church and state. The church party took advantage of an international dispute to intrigue with the French, and Louis Napoleon sent an army of invasion. An assembly of notables declared for an hereditary empire, and the Archduke Maximillian of Austria was induced to accept the crown. The struggle with the forces under Juarez continued until the hands of the United States were freed by the conclusion of its own Civil War. When at this time President Lincoln's attention was called to the fact that the French had sent an army into Mexico under Maximillian, and he was asked what he meant to do about it under the Monroe Doctrine, he said that the situation reminded him of the story of the two deacons who had been bitter enemies for many years. One was taken very sick and his recovery was questionable. The congregation of the church was anxious that he should not die unreconciled, and finally brought the two together. They shook hands and forgave each other, but as the one was leaving the room, the sick man sat up suddenly and said: "Wait a minute. Of course, you know that if I get well this doesn't go." The United States got well from the Civil War, and disregard of the Monroe Doctrine did not go. Lincoln notified the French emperor that he must withdraw his troops, and sent an army corps to the frontier ready to emphasize this communication. The Emperor yielded and ordered the French soldiers to return to France. Maximillian soon fell, and independence under President Juarez was restored. Juarez was succeeded in the presidency in 1876 by General Porfirio Diaz, a strong and sagacious ruler, who remained in power for 30 years. When the aged Diaz was deposed, in 1911,

the era of peace and prosperity ended, and 10 years of turbulence have followed during which there have been nine presidents.

The people of Mexico today may be divided into three well-defined classes; first, the native Indians, comprising the majority of the population; second, the Spaniards born in Europe or in Mexico, the latter often called Creoles; and third, the mestizos, or half-breeds, crosses between the other classes and the Indians, in varying degrees.

Mexico, in theory, is a democratic and federal republic, with twenty-eight states, two territories, and a federal district. In divisions it is analogous to the United States. Each subordinate part manages its own local affairs and all are bound together according to the amended constitution of 1857. The president is chosen by electors of the people in general election. There is a congress of two bodies, the senate and the house of representatives. The dominant religion is Roman Catholic, but all other forms of faith are tolerated. The public schools are supported by the state, and the attendance law is well enforced. English is taught in all public schools. The scientific methods in education, like those in South America, are of French origin. As a matter of fact a trip through Mexico gives one much the same impression as a journey into Peru.

The Mayas, and those who lived before them, the Toltecs, had developed a wonderful civilization long before the Anglo-Saxons had emerged historically. Remnants of the Aztecs, who established themselves in Mexico during the thirteenth century, are still to be found in broken tribes of more than one hundred groups, with various dialects. The relic which gives the best testimony of the mental powers of the early people is their calendar, which was carved in 1512, and is now built into the cathedral in Mexico City. Evidences of remarkable prehistoric Indian civilization are now being found in explorations in southern Mexico and Guatemala.

POLITICAL

The Indians today have little, and desire little. With their thatched-roof wattle huts, a few pigs and chickens, a banana tree, and a cocoanut tree they are happy and contented.

The people of the upper class in Mexico, who comprise about 10 per cent of the population, are educated, prosperous, and, naturally, contented. There is not a more intelligent and courteous people in the world. They speak French as well as Spanish. Refinement is ingrained in them from their background of the culture of centuries.

The population intervening between the uneducated Indians and the cultured Mexicans, about 20 per cent, might be called the middle class, and the government of Mexico today is in the hands of the radical group of this class. The leaders of this class are anxious to divide the great estates, and when one thinks of the many estates that run from 1,000,000 to 6,000,000 acres of the most fertile soil, of the great mines, and of the petroleum and other minerals, one may in some degree appreciate this view point.

The upper class in Mexico hate the present government with an abiding hatred for attempting to break up the large estates. The many revolutions in Mexico have had their origin in the middle class. Unionized railroads and trades badly led are trying out theories which include those long popular among the radicals, who teach that destruction of the property of the rich adds to the wealth of the poor, and that leadership by the fourth-grade mind will bring on the millenium. However, the Indian has been the cannon fodder for these revolutions, and he is sick of his job. It is doubtful that another general revolution will develop, at least for some time. The armies have lived on the country, and the agricultural districts have been swept by the troops so often that there is little left to live on. Mexico, who should feed a great share of the world, is getting from the United States much of the corn and cattle with which to feed her people. All the thinking people of Mexico are turning their eyes to their neighbor to the north, hopefully but doubtfully, for they have not yet forgotten that Texas was once Mexican territory.

However, conditions in Mexico today are fairly settled. There has been in recent years a series of more or less bloody political revolutions, but in the firm hands of President Alvaro Obregon and General Plutarcho E. Calles, secretary of state and chief of the cabinet, peace is being brought about. After all, the history of Mexico has been only that of other countries. Riots are not wanting in our own country. Military protection is to be found on all railroad trains in Mexico; it is needed on ours.

MEDICINE AND SURGERY IN MEXICO

Owing to political unrest in Mexico developments in the science of medicine have been retarded, and the civic hospitals are consequently in poor condition. In spite of this, excellent work is done in them and is more notable on account of it. Under the administration of President Obregon, General Calles, secretary of state, has taken up the matter of improving the hospitals.

He is giving every possible support for the purchase of new equipment, and several fine hospitals are now projected. Seventeen years ago, President Diaz constructed a very fine hospital of 800 beds in Mexico City, on the separated pavilion plan much like the Virchow Hospital in Berlin. The hospital covers a great deal of ground which is beautifully parked. The Military Hospital, with 600 beds, under the direction of Dr. Francisco Castillo Najera, is a very old structure in the oldest quarter of the city. This is to be replaced by a fine hospital in a beautiful suburb. The Military Hospital provides quarters for the sick wives and children of the soldiers as well as for the soldiers. The hospital staff is excellent, and the work is modern. Dr. Najera is an active, progressive man, and conducts the affairs of the hospital most intelligently. Spinal anæsthesia with cocaine is used very largely, and we were told that in over 5,000 cases there had been no direct mortality from it. We witnessed several operations under this anæsthesia, one especially clever, for abscess of the lung.

We had an opportunity to visit the private sanitoria of Dr. Ulises Valdes and of Dr. Gabriel M. Malda. The morning we visited Dr. Valdes he performed, among other operations, a subtotal hysterectomy for a large myoma, and I was much pleased to note with what great pains he saved both ovaries. He tied all knots by the one-forceps method, manipulating with the forceps as dextrously as though they were his fingers the short end of a catgut thread deep down in the pelvis. Dr. Malda performed a very skillful operation in which we were much interested, an amputation of the leg at the point of election just below the knee, after the method of Dr. Monteo de Oca, a distinguished Mexican surgeon of bygone days; this technique probably is unknown outside of Mexico. The amputation was made with mathematical accuracy and the muscles were divided in a manner to give excellent function at the knee for an artificial leg and foot or to permit the use of the peg leg of the natives. Dr. Malda has a number of clever methods for facilitating work, among others a slipnoose that he uses with catgut which allows very expeditious and accurate suturing of deep wounds. I had never seen it before.

One evening while in Mexico City we attended the meeting of the medical society of the city; about 50 doctors were in attendance. The chief paper of the evening was on a urologic subject, illustrated by lantern slides. An interesting paper on yellow fever also was presented. The Rockefeller Foundation, greatly interested in the subject of yellow fever, has worked in conjunction with the Mexican Government for eradication of the disease. The domestic mosquito (*stegomyia calopus*), which carries the disease, lives in clear quiet water, and is always to be found within three hundred feet of a dwelling place, in drinking pools, wells, cisterns, tubs, and so forth. In Mexico this mosquito is not often found above an altitude of three thousand feet. Five per cent infestation of water is considered safe. Top minnows are being used to destroy the larvæ of the mosquitoes. At first the native Indians objected very strongly to having these fish living in their drinking water, but this point of view is being gradually corrected through education. Noguchi's serum has great value in the treatment of the disease, both as a prophylactic and a curative; it is almost certain cure if given within the first 3 days after the onset of the disease. We had the pleasure of meeting the president of the Yellow Fever Commission of Mexico who has occupied this position for more than 20 years. In Colima, Captain Parks showed us a record of his monthly examinations which included over 11,000 tests, with an incidence of infestation of less than 1 per cent. This was a surprisingly good record, and the town of Colima is accounted safe. Captain Parks is conducting experiments in breeding fish for destruction of those numerous forms of mosquito larvæ which, unlike the stegomyia, live in quiet but impure water. At the present time he is using thousands of minnows from the streams, but as they are unsuited to this type of life he is attempting to develop the gold fish or carp which for years have been accustomed to dark and stagnant water.

The medical schools in Mexico are connected with the hospitals, and to a great extent the students live in the hospitals. Most of the textbooks used in medical schools are in the French language, and the system of education as well as the method and technique employed in the hospitals and operating rooms is essentially French. Practically every physician speaks French as well as Spanish and most of them have studied in the universities and hospitals of France. We were especially interested in some beautiful slides of the transitional stages of carcinoma in tissues developing cancer, shown us by Professor Guiterrez, chief of the department of pathology of the Medical School of the University of Mexico.

In Guadalajara there is an active body of medical men, and we had the privilege of attending a meeting of the medical association of the

city. Dr. Barrios and Dr. Chauvas are among the leading surgeons in the city.

A visit to Mexico in the interest of medicine and surgery will be found most interesting and profitable. One should particularly study the tropical diseases, which more rapid methods of communication will gradually bring to our own people. The medical traveler is received with the greatest kindness by members of the profession, and is accorded every courtesy by officials of the Government. Heretofore many, unfortunately most, Americans who have gone into Mexico have done so for the purpose of commercial exploitation. They have been careless if not rude in their dealings with these sensitive people in whom courtesy is ingrained, and on returning to America they have given their impression, derived from experience with the lower classes. The friendliness and charming hospitality accorded to us in Mexico caused us to leave with regret. Twelve years ago, in company with Dr. A. J. Ochsner, as now, I visited Mexico, and I hope to go again in the near future. The relation of the United States with the Spanish American countries will in time, when the broader, more intellectual people of both countries know one another better, become one of enduring friendship. Members of the medical profession can do much to promote cordial relations, for science has no country and its adherents meet on common ground. The officers of the American College of Surgeons expect to extend the membership of the association into Mexico, and there is no doubt that it will do much to cement the growing fellowship and friendship between the people of Mexico and the United States.

LATIN-AMERICAN SURGEONS

REPORT OF OFFICIAL VISIT TO COLOMBIA, VENEZUELA, AND CUBA FOR THE AMERICAN COLLEGE OF SURGEONS BY EDWARD I. SALISBURY, M.D., DENVER, COLORADO

PART I

THE SPANISH MAIN

SOUTHWARD HO! To the Spanish Main and our Brethren o' the Coast! It smacks of a romance of the sea, of conquest and despoliation; but no, for we bow in humble submission to the conquering graces of three more of our American neighbors. To Colombia, Venezuela, and Cuba the College extends the hand of fellowship and a hearty welcome to its ranks.

The third year of our Pan-American work has found the College extending its activities to those countries bordering upon the Caribbean Sea, or, as it were, to those republics bounding the Spanish Main.

The history of the Main, with its tales of conquest, of adventures, of colonization, and of piracy is perhaps better known among the nations of the world than the interesting story that accompanies the march of civilization to India, Australia, or to our own northern continent. The very mention of the name recalls many a romantic tale and conjures up the dreams of our boyhood past, when the midnight taper burned low and the blood curdled in our veins as the harrowing details unfolded, disclosing the buried treasure or the doings of a Pizarro or a L'Olonois. An enchantment still reigns over those seas, coasts and islets, and a red-blooded man with a God-given imagination cannot sail the Main but that the comfortable ocean liner as by magic fades away, and he finds himself pacing the deck of a phantom ship.

ITINERARY

January 18 Left New York on *SS. Santa Teresa.*
January 25 Arrived Colon, Panama.
January 26 Left Colon on *SS. Santa Marta.*
January 27 Cartagena, Colombia.
January 29 Arrived Puerto Colombia, proceeded to Barranquilla.
January 31 Lower Magdalena—River boat *SS. Barranquilla* for La Dorada.
February 8 Arrived La Dorada, proceeded on rail around rapids to Beltrán.
February 8 Upper Magdalena—*SS. Mariscal Sucre* for Girardot.
February 9 Arrived Girardot.
February 10 Via Girardot Railway and Sabana Railway to Bogotá.
February 21 Bogotá to Girardot.
February 22 Girardot to Honda, aboard *SS. Union.*
February 23 Arrived Honda, proceeded by rail-motor-car to La Dorada.
February 24 Lower river boat *SS. Juinin* to Barranquilla.
February 28 Barranquilla.
March 3 Barranquilla to Puerto Colombia by rail.
March 4 Left Puerto Colombia on *SS. Venezuela.*
March 6–7 Curaçao, Dutch West Indies.
March 8 Puerto Cabello, Venezuela.
March 9 La Guayra, proceeded by rail to Caracas, Venezuela.
March 17 Left La Guayra on *SS. Asian.*
March 18 Puerto Cabello, Venezuela.
March 19 Curaçao, Dutch West Indies.
March 24 Cartagena, Colombia.
March 25 Colon, proceeded to Ancon, C. Z.
April 1 Left Colon on *SS. Toloa.*
April 2–3 Puerto Limon, Costa Rica.
April 6 Havana, Cuba.
April 13 Left Havana on *SS. Calamares.*
April 17 Arrived New York.

THE VOYAGE

The *Santa Teresa*, a commodious and well appointed steamer of the Grace Line, carried me from the turmoil of our metropolis on a murky and cold afternoon during the month of January. Farewell to Miss Liberty became a how-do-you-do to Mister Freedom. Freedom of the seas is really a wonderful thing—if not a bulwark, it gives at least a stimulus to the North American constitution. Night fell with a biting wind howling through our shadowy masts with their derricks and ropes. By bed-time a look from the starboard rail told us that our good ship had left Barnegat and the lights of the Jersey shore far behind.

On the morrow a clearing sky and a balmy softness of the air greeted us. Our nearness to the Gulf Stream was already noticeable by the moderation in the weather. This sudden change was sufficient—the spell was upon us, and lo! we no longer steamed in a modern ship with the Stars and Stripes floating above us, but sailed straight away upon a goodly *bergantin*, flaunting at the mizzentop the gold and red emblem of Spain.

Starboard the helm, and we're off for the Windward passage!

"Swiftly through the foaming sea
Shoots our vessel gallantly
Still approaching as she flies
Warmer suns and brighter skies."

And so we stood out to sea with well-filled canvas while the ropes creaked under the strain and the sailors fell to their chanties.

Upon a morn the cry of land went up and there on the port was Watling Island, or San Salvador. It recalled the daybreak of October 12, 1492, when the weary watch first called out: "Land! Land!" In the mists hovering over the isle were three phantom ships riding peacefully at anchor in the cove, while ashore knelt a little band, and across the waters their voices arose, chanting hymns of thanks to their Maker for the new-found land.

Soon we were in the quiet waters of the Windward passage, and our course laid, to avoid Tortuga, near Cape Haitien—Tortuga, that rendezvous for the wolves of the sea—to where an Esquemeling led his zee rovers, a L'Olonois his corsairs, and a Morgan his buccaneers. Suddenly from behind a cloud-bank the clumsy galleon of a Portingale loomed up, her pennons waving in the breeze. In hot pursuit followed a brig flying the black flag of death. The pursuer gained a pace and came alongside its prize. They scuttled the brig that they might fight the harder, and boarded. In the sulphurous air was heard the crack of harquebus and pistol, while cries went up with every cut and thrust of the blade. A plank was pushed out over the high poop deck, and one by one, to the goad of a boat hook, the defeated went to their death. Some few met their end aloft and were left to dangle from a yard-arm, an example to all comers.

What matter it if in a dream we lose a few hundred years and give a passing thought to those heroic deeds, now brilliant pages in the history of our war with Spain?

The Caribbean Sea

On the starboard is Cape Maysi, the eastern tip of Cuba, and a few miles up the southern shore are Santiago and Guantánamo. In the blue waters of the Caribbean that wash these strands lies the the fleet of Admiral Cervera, who bravely went out to meet us July 4, 1898, knowing defeat certain.

As Spain's power on the seas was born in the West Indies, so it perished in the place of its birth.

There is perhaps no place in the seven seas more loved or more feared by the mariner than the Caribbean. This beautiful turquoise of the Atlantic, reflecting the deep blue of a tropical sky, can become on occasion a veritable inferno, when contrary winds lash its currents into foam-laced mountains and toss sturdy vessels about like toys. Truly the early adventurers must have felt that El Dorado was nigh when they sailed into that sea in calm seasons, and on contrary days that the old superstition, that the hand of the devil would reach out of the unknown sea and snatch them to death, would come to pass.

Columbus named the coast bordering this sea, from a region about Santa Marta in Colombia to Cape Gracias á Dios in Central America, Castillo de Oro (Castle of Gold) and Costa Rica (Rich Coast). Castillo de Oro included that part of Tierra Firma (as the whole was named) now known as Colombia and Panama.

Columbus sailed into every nook and cranny of that coast in his voyages to the New World. He named Navy Bay, where Colon is now located, Nombre de Dios (Name of God), and Puerto Bello (Beautiful Port).

Puerto Bello and Cartagena were strongly fortified by the early Spaniards, for it was here that the *bergantins* and caravels and the great caracks laden with treasure gathered and awaited a place in the convoy of galleons or men-of-war to escort them to the mother country.

Colombia

Cartagena

Cartagena was the largest, and is today the most interesting city, of the coast. Protected seaward by a coral reef and landward by the fortress of San Felipe and the forts of the beautiful harbor, it still could depend in battle upon the enormous walls that enclosed it on every side.

The harbor is often compared to that of Naples. La Popa, with its ancient convent surmounting it, forms the background, towering over the city. There are two entrances, Boca Chica (little mouth) and Boca Grande (great mouth)—the latter being closed by the Spanish to save fortifying it. As a ship passes through Boca Chica, it is met on every side in its approach to the city by projecting forts that stood guard in more turbulent times, when Drake, Raleigh, Hawkins, Vernon, and Pointis attempted to storm this stronghold.

It was one of the greatest pleasures of the trip to wander through the land gates of this old city and walk its narrow streets and the broad tops of its bastions, to explore its tunnels and dungeons,

the while ruminating on the past. Here were the embrasures for the great cannon, there the slots where the chains passed to lower the drawbridge across the moat to the outer enclosures; a ring here for securing the portcullis that barred the entrance to a tunnel of escape, and another there with its fetters for a prisoner.

The old house of the inquisition still contains mute evidence of an intolerant day, when the Spanish mind, warped by the cruelty of the Moor, had turned to retaliate by forcing its religion upon others. There are the rack, wheel, tongs and dungeon, just as they were the day the Mother Church put an end to the intolerance of the Spaniard. Strange that Spain should carry her troubles, coming out of the Moor invasion, to a new land; but our Puritan did the same.

I found an old history of Cartagena in one of its bookshops. It is replete with old legends and traditions of the place. It contains stories of conquest and war, of the bravery of an adventurer and the cruelty of a pirate, with quaint references to their life and oft their death. Then too there are tales of love, even to the wooing of the Governor's daughter by a daring corsair. The book is worthy of translation.

Of medical lore I might mention one little story connected with the founder of Cartagena de Indias (Cartagena of the Indies), as it was called in contradistinction to Cartagena in Spain.

Cartagena was founded in 1533 by Don Pedro de Heredia. The locality had previously been visited by Bastidas, the founder of Panama, by Vespucci, and by others, but the strong resistance of the Indians prevented them from establishing a colony.

Heredia, as tradition states, was more fortunate than the rest, as he inherited from his forebears the inclination to adventure and to boldness, so that by his constancy in winning daily battles with the Indians, he vanquished them. Referring to the chronicles of his early life, to show his spirit—upon a certain night, while out bent on a gallant adventure in the narrow and divided lanes on the outskirts of his native village, he was attacked by six gentlemen. These gentlemen so badly impaired Heredia in the affray, even to the losing of his nose, so states the story, that afterward it was restored by surgeons who newly formed it through the medium of rhinoplasty, using the fleshy part of one of his arms. The story continues and says that now cured, but finding his once comely nose deformed and of bad color, Heredia, burning with wrath, sought out his aggressors, challenged them in unequal combat, and killed three of them. This I recite as an example of the plastic art in surgery as early as 1520.

Cartagena is a city of perhaps over thirty thousand without a water supply except the gentle rain, which for some reason is not abundant in that small tropical area. Water was selling at the rate of thirty cents for a five-gallon gasoline can filled sparingly with the precious liquid. A prominent English lady living in the city told me that frequently her Sunday morning general ablution was provided by the drippings from the ice-box. Water is brought from a great distance in kegs lashed to the backs of burros. Many of the lower classes obtain a species of the liquid, neither sweet nor altogether brackish, by digging holes along the beach and dipping up the water thus filtered drop by drop.

This city is one of the principal *entrepôts* of the country and is connected to the Magdalena River by a short line of railway.

Other Colombian Ports

The other great port is Puerto Colombia near the mouth of the Magdalena, but it too is separated from the river port, Barranquilla, by a railroad.

Sabanilla was the ancient port to the river and sea, but time made a sand-bar that necessitated its removal to deeper water. At present all that remains is the old Spanish Custom House, a landmark for the mariner (to avoid), for most maps mark the port as Sabanilla, and in recent months a schooner from Germany laden with cement and dynamite found herself high and dry on the shoals while steering for this old port.

The Magdalena River

The capital of Colombia is Bogotá, and is situated on a high plateau just over the eastern range of the Andes. The principal approach to the capital is by the Magdalena River, which flows in a valley formed by the eastern and central ranges of the Andes. If memory of geography serves me rightly, the Magdalena ranks fourth among the rivers of South America—the order being Amazon, Orinoco, Paraná and Magdalena. Ocean-going vessels cannot enter the river, or La Boca de Ceniza as it is called, because of a bar of silt that has collected. However, Colombia has in the past few months passed a bill authorizing the dredging of the mouth and river to Barranquilla. This will be a great advantage in the handling of shipping, as it can be transferred directly to and from ocean vessels and river steamers.

The trip up the Magdalena can hardly be equaled even by a sojourn on the Nile. With favorable conditions, viz., plenty of water in the river, and aboard an express boat, one should reach Bogotá in seven or eight days. The journey from Barranquilla to Bogotá is about nine hundred miles and necessitates several changes. The express boats carry the mail and are convenient in that all carriers make connection with passengers and mail. The first leg of the trip is on the *rio bajo* (lower river) to La Dorada, then comes a rail trip around the rapids to Beltrán, where a smaller boat carries one up the *rio alto* (upper river) to Girardot at the head of navigation. The night is spent at this river port and the trip continued by rail to Bogotá, a full day's travel over the Eastern Cordillera.

The river boats are similar to the old Mississippi river boats with stern paddle-wheels. They have metal rounded bottoms and draw three to four feet of water. There are usually three decks, the lower one reserved for the boilers, which are placed forward with a supply of wood, which is the usual fuel; midship the freight is stowed, and aft are found the engines, kitchen, and two or three pens for cattle, pigs, and chickens in lieu of a refrigerating plant. Slaughtering goes on daily on this part of the deck, as the supply of available meat is consumed. The staterooms are furnished with a canvas cot, wash basin and pitcher, and an electric fan. The passenger supplies his own linen and towels. The water supply to the rooms is direct from the muddy water of the river. The drinking supply is filtered through a stone jar, and this is hardly safe for the stranger. A limited supply of carbonated water is sold at the bar, or the traveler may bring a case or two aboard.

I left Barranquilla Tuesday evening, January 31, on the river express boat. Our boat experienced considerable difficulty in forcing itself from the quiet channel into the turbulent waters of the lower river, where they rush out of the wide delta to meet the ocean. Once out upon its broad expanse we turned our prow toward the Southern Cross and began our ascent of the Magdalena.

The bed of the river is quite tortuous, and the channels for the boats change from day to day as the silt and sand are carried away from one part and deposited in another. We were one full week upon the lower river, but every mile traveled was a revelation. The first few days carried us past mangrove swamps and marsh lands covered with impenetrable thickets and wild plantain and banana. As we ascended further, the banks took definite form and the terrain spread out into wide *sábanas* that stretched forth to meet the foothills in the far distance. Here and there were native thatched huts with adjoining garden spots safely enclosed and protected from the domestic animals by close wattled fences. Scattered out upon the plains and at the river's brim were small herds of cattle. Now and then we passed or stopped at native villages where the populace came down to meet the express—a weekly event among the attractions of the town. Daily there were other stops at the wood supply stations, and at these times we sweltered from the intense heat and were greatly annoyed by the mosquitoes. Each night we suffered the same tortures—because of low water, navigation was dangerous, and we tied up the boat at the first convenient tree ashore as dusk came on. Daybreak would find us continuing the journey in midstream where a refreshing breeze made living more bearable.

There are always many natives of the better class traveling and they are delightful companions. They have many local stories to tell of their country and keep one entertained. Some will try their knowledge of English with you, and you always feel that perhaps they are just a pace ahead of you and use better English than you do Spanish. In the evening the *tiples* and guitars are brought out, and all indulge in their folk songs and *arias* from the popular operas. The younger generation spend the early evening in games resembling very much those in vogue in our own country. I tried out my Spanish by playing with them, much to their delight when I was caught napping and made "it." I was thus forced to make up a sing-song rhyme to suit that stage of the game, and apparently it had the desired effect.

Each day brought new sights and wonders. After two or three days we were impressed by the wealth of bird life. Continually we saw great flocks of ducks, parrots, paraquets, and *garzas*. The *garza* is the heron or egret bird, and there are several distinct varieties—the black, white, grey, and even the rose-colored heron. At times there would be hundreds of these birds standing in the shallow water over a sand-bar. Whenever our boat passed close to a wooded bank, there was opportunity to see many strange and beautiful birds in the trees. Occasionally, but rarely, there were monkeys, chattering and climbing from tree to tree. At one time a few of us saw a snake spring from the bank and strike a bird wading at the water's edge—it happened in the twinkling of an eye, and the reptile captured its prey. The chief attraction of the Magdalena is the huge alligator or crocodile that infests its waters. The question of the species is the source of continual

argument among the travelers of this river, and the point of their man-eating or non man-eating tendency is thrashed out daily. Be that as it may, I saw evidence of two deaths from either crocodile or alligator—the first, one of our boatmen who fell overboard, and the other a boy or young man who was found the next day in one of the ports—his head only was recovered. The largest of these animals or reptiles appears to be twenty-five to thirty feet long and possibly three or four feet across the back. They appear in enormous numbers—in one small group I counted thirty-six.

Barranca Bermeja

The end of the first week brought us to Barranca Bermeja (Vermilion Bank), where the central depot of the Tropical Oil Company is located. The oil fields of this company are some miles back in the jungle along the Rio Colorado, but the storage tanks, the offices, dwellings, and hospital are situated at this point on the Magdalena. The river bank here is very high, and the earth is a red clay—hence the name of the town—Vermilion Bank. The tributary river whose waters are colored by this clay is named Rio Colorado, or Red River.

The sixth day of February was spent on a sand-bank, from which we finally released ourselves by carrying the end of the cable ashore and making it fast to a tree while we wound up the other end on the capstan. After uprooting several trees, this process succeeded in drawing us into deeper water.

La Dorada—Upper Magdalena River

On February 8 we reached La Dorada, the end of the lower river travel. After transferring mail and baggage we were transported by a narrow-gauge railway around the rapids to Beltrán. This line of railway passes through a variety of country. For a short way to Honda it follows the river and then turns out at a sharp angle through the hills and rugged crags of a castle-like formation to the plains at the foot of the Central Cordillera. Here lies the town of Mariquita, a shipping point from the mines of the Cauca Valley beyond. The road turns abruptly back from Mariquita to the river at Beltrán. At this point we embarked on the upper river boat *Marisca! Sucre.* The crowd on this little boat exceeded many times the accommodations. There were hardly enough staterooms for the lady travelers, and the men all "parked" on and under tables and benches, and upon the few cots provided. A bribe of a *peso* to one of the deck boys permitted me to spend the night on deck on one of

Magdalena River and Tributaries, Colombia

City Wall, Cartagena, Colombia

the cots, with fifty others "camping" in the neighborhood. Everyone was stirring at daybreak, and one was well repaid for rising early. The boat was forging ahead through rapids with the lower deck awash. The river bed had become the floor of a rock-bound canyon, and the roar of the struggling engines echoed back from towering cliffs. This is the most picturesque part of the Magdalena. New verdure greeted us upon every side, and in the lifting haze dim forests of *balsa*, *ceiba*, and *caoba* were seen covering the adjacent mountains.

As we steamed along, the river had all the appearances of one newly discovered. Flanked alike by jutting rock and bamboo, the upper river is truly beautiful. Occasionally, far to the westward, we could catch a glimpse of Mt. Tolima with its snow-capped peaks, strange to contemplate when you consider that it is only four degrees from the equator. As the morning wore on we met many *balsas*, or rafts, and *champans* floating down-stream with great cargoes of pottery and produce for the native markets. Along the rocky flats near the villages the populace were out taking their daily bath—men, women and children alike—while just at the water's edge the family laundry was in full process. Further up-stream Indians were in evidence, but very few of them. The men were fishing with nets, and a few of the women were washing their garments on the stones. The raiment of the men was very limited. A very bright red semi-skirt about the waist was the only covering, excepting the straw hat with its brilliant red band. The Indians were quite adept in handling their *cayucos* or canoes in the swift-flowing stream, and it seemed to delight them to ride the waves caused by the passing of our boat.

Girardot to Bogotá

We arrived at Girardot at sundown and betook ourselves to Hotel San German, thankful to be

Bolivar Monument, Cartagena, Colombia

free from boat-cabins and mess-tables. The tropical hotel is a marvel. You pay for a bed rather than a room. I shared a room with traveling companions, a man and his wife from the United States. We had each a corner in a large *adobe* room, each cot screened apart from the rest of the space. Beds are not in use, as they are hot; so canvas is stretched tightly on a frame to provide a resting place. On the ranches a tanned cowhide cot is quite the thing. All are furnished with mosquito nets.

In the morning our *equipajero* called us in order to be off for Bogotá. An *equipajero* is a sort of courier who travels up and down the river and cares for your baggage in its many transfers. He is indispensable, and one of these men can care for a number of passengers. He hires porters at every change and guards your belongings. The transportation companies do not have a baggage department to care for your trunks. This is left to the *equ pajero* who is usually quite loyal to his customers.

Our train left at eight o'clock for the climb over the mountain. It is a slow and dusty trip until midday. By that time the fields of banana and sugar cane have been left far below and we

River Boat of Lower Magdalena

stop for lunch in a more temperate clime. The profusion of fruits at La Mesa is marvelous. This mountain stop has the advantage of receiving in its market the fruits of the tropic and temperate zones—grapes, apples, peaches, strawberries, melons, as well as oranges, bananas, mangoes, *nisperos*, *nameys*, *anonas*, and the hundred and one other delicately flavored fruits of the tropics. At Esperanza, the next stop, one experiences a delightful change in the atmosphere and vegetation. It becomes pleasantly cool, while all about are beautiful palms and shading trees. Flowers are blooming in profusion. Bougainvillæa, hibiscus, acacia and royal Poinciana are everywhere. Here many of the travelers stop to become accustomed to the change before proceeding to Bogotá, which is eighty-six hundred feet above sea level. The journey from here is very interesting. Farms with corn and wheat, and plantations of coffee and cacao spread out in one beautiful vista. The air becomes cool and clear, and, when at last we reach the tunnel, everyone prepares for a quick change from linen or palm beach to wool, or seeks his overcoat. The minute spent in the tunnel changes everything from clothes to temperature. Once on the farther side, the chilly

Capitol, Bogotá, Colombia

blast of the *páramo* makes the stranger wish for furs, and the native instinctively ties his kerchief over his mouth and nose that he may not contract pneumonia.

We were soon over the summit of the range, which is much higher than Bogotá, and began to glide down to the great plateau of Funza, where the capital is located. We changed trains at Facatativá, as the roads are of a different gauge—the Girardot Railway being a yard gauge and the Sabana a meter. It is only in recent years that the Girardot line was built, as previous to that time the old mule trail was used to Honda, where freight was transported to the river boats. The Sabana Railroad has been in existence for many years; in fact it was one of the first built in Colombia. When it was decided that progress in transportation meant the building of railroads, the capital was, of course, the first city that should have one. Rails, engines and equipment were dragged up the trails over the mountains to the plains, and construction proceeded from the center of the country instead of building it from its sea and river ports.

Plateau of Funza

The great plateau of Funza is most impressive to view. After the long and hot tropical trip one feels as if he were in a fairy land. As far as the eye can see are rolling plains and verdant *sábanas* reaching out to the faint rim of mountains that enclose them. Fields green with growing wheat, millet, and barley, beautiful herds of Holstein and other cattle grazing in pastures where meandering brooks flow, make a picture of industry and contentment. To add beauty and quaintness to the scene are the little white, pink, and blue ranch houses with tile roofs, and a surrounding wall and stately gate, all of which have a tile coping. The lanes from gate to house

"Spotless Town" and Pontoon Bridge, Willemstad, Curaçao, Dutch West Indies

are edged by rows of majestic eucalyptus trees, giving a most attractive effect. The eucalyptus tree is not indigenous, but was imported many years ago from Australia.

The native population, that is the gentry, of the mountainous and plateau region is mostly Indian. They are a simple folk and have a rather comely appearance, with rounded faces of an olive hue and rosy cheeks; faces of beings upon whom the strain of life it seems has never fallen. They go about with their wool *ruana* over their shoulders, a quite contented lot. Seldom they travel, and very few of them have ever visited the falls of Tequendama, where this cataract tumbles six hundred feet (three times the distance of Niagara) from the very edge of their landscape to join the head waters of the Orinoco. It can truly be called one of the wonders of the world, yet to these people its existence is mere legend. These folk are the descendants of the old Chibcha nation that was conquered by the Spanish, as were their counterpart in Peru, the Incas. The history of the discovery of this plateau and its people is extremely interesting. Almost simultaneously there arrived in these regions three expeditions, one each from the North, South, and East. The incident occurred in 1538 when Gonzalo Jiménez de Quesada appeared with one hundred infantry and sixty cavalry. He had set out two years previously from Santa Marta by land, and the Magdalena, with eight hundred men and one hundred horses. Presently Nicolas Federmann loomed up with one hundred half-starved men. He represented a German exploitation company, the Welsers, a banking firm, and had traveled up the Orinoco and Meta rivers, having started on his long search five years before with four hundred well-armed and provisioned men. Following his arrival came Sebastian de Belalcazar, an associate of Pizarro in Peru. He left Quito after the conquering of the Incas, and was in search of another civilization said to live far to the North. Quesada evidently played the part of a diplomat and organized all the forces against the Chibchas, a nation said to have numbered a million souls. Having accomplished his end, he settled peaceably with the other *conquistadors*. To him is credited the founding of Bogotá, or Santa Fe as it was named and declared a city by Charles V in 1540. Bacatá was the name of the old Indian capital, and thus today has developed the name Bogotá or Santa Fe de Bogotá.

Bogotá

It was dusk when our train reached Bogotá. On our approach we could see the twinkling lights of the city nestled at the foot of the mountains Guadeloupe and Monserrat. The station is a modern one, with train sheds and gates—quite fitting for the capital. All was bustle and hustle in the streets, with coaches, autos, and tram cars in profusion. I was whisked off to my hotel (one that I had been a guest in several years before), and I began preparations for an enjoyable week of work and association with the medical faculty of Bogotá.

The city has about 160,000 inhabitants, a great many more than industry can care for; hence there is a great percentage of pauperism. The climate is delightfully cool and pleasant during the day, but it is rather uncomfortable indoors at night, as no provision is made for heating the houses. Bogotá is noted for its beautiful buildings and churches, the cathedral being a magnificent example of the Roman type of architecture of the Spanish Renaissance. The residential district of Chapinero contains many beautiful chalets and villas, homes of the well-to-do, although not a few still retain their typical Spanish homes in the heart of the city. There are many pretty drives about the city, one in particular, Paseo Bolivar, which is located on Mts. Guadeloupe and Monserrat, and permits of a wonderful view of the city. Upon one of these peaks there is a chapel to which many people make pilgrimages. I experienced one day almost the sense of seeing an apparition. I was out for a walk. Heavy white clouds had obscured the mountains so that the sky alone appeared in their place. Suddenly the sun came out, illuminating the fleecy cloud-banks on the mountains, and there suspended in mid-air was the little white chapel, a perfect miniature upon porcelain. The

effect was startling, but lasted only a moment when it was spoiled by shifting clouds.

Bogotá held the court of the Viceroys in the pre-republic days. It was the center of the Spanish government in South America. In the Palace of San Carlos were read the declarations of the king which were law and life to the New World subjects. In this same building I met the Secretary of External Relations, Señor Dr. Antonio José Uribe. I was introduced by my friend, Dr. Carlos Adolfo Urueta, former minister from Colombia to Washington. Both of these men were influential in the Colombian ratification of our recent treaty with that country which was exchanged during my stay in Colombia.

I spent a full week visiting the hospitals, clinics and institutions of the city, a report of which is appended to this article together with an announcement of the committee nominated to act for Colombia.

Bogotá to Barranquilla

I rather dreaded the return trip down the river. After finishing my business, it was too late to catch the express boat, so I determined to try my luck in catching intermediate boats. It worked very well. The first day was spent going down the mountain to Girardot, where as usual one must remain overnight. I was fortunate in obtaining accommodations on the upper river steamer *Union* which left Girardot the afternoon after our arrival. This boat carried us to Arrancaplumas, the port for Honda, and several miles below Beltrán, where we had embarked on our upstream trip. Honda was reached the next afternoon, where I learned that a boat would leave La Dorada the following morning. It was out of the question to go by train that night, and the morning train left too late; so, after meeting the general manager of the railroad and explaining to him my desire to catch the boat, he placed at my disposal a motor bus on car-wheels which landed me safely in La Dorada by sundown. The *Juinin* left port early the next morning and arrived in Barranquilla four days later, on February 28.

Colombia to Venezuela

Departure

It was necessary to delay a few days in Barranquilla until March 4, when I boarded the *SS. Venezuela* of the Dutch West Indian Mail Line for La Guayra, the port for Caracas. The voyage would have been an enjoyable one for me had I not been suffering from dengue, or break-bone fever, which I probably contracted along the lower Magdalena and continued to have until after reaching Caracas.

Curaçao, Dutch West Indies

Two days were spent in Willemstad, Curaçao, Dutch West Indies, and one day in Puerto Cabello, the port for Valencia, Venezuela, before we reached La Guayra on March 9.

Willemstad is a very pretty little port with an inland harbor. The town lies on both sides of the inlet and is connected by a pontoon bridge. This bridge is operated as a private enterprise and a toll of two cents for crossing is charged to persons wearing shoes, while only one cent is levied upon the barefooted or those who wish to remove their shoes and carry them. When a steamer is entering or leaving the harbor, the bridge is swung back by a cable that is wound upon a steam windlass. The inhabitants are a mixture of Dutch and Spanish, and so is their language. Curaçao is a colony governed by the Dutch and enjoys a free port. I was able to supply my wants in American made goods at prices several cents cheaper than at home.

Venezuela

Puerto Cabello

Puerto Cabello is a rather busy little port and has a small shipyard. In the plaza near the wharf is a rather dignified monument erected to the officers and soldiers of the United States who aided the Bolivian States in the war of separation from Spain. It bears the shields of Venezuela and the United States, and the whole is surmounted by a golden spread eagle.

Caracas

Caracas can be reached by train or automobile from La Guayra, a distance of about twenty-three miles. It is located on a plateau just over the coast range, and, having an altitude of three thousand feet, it enjoys in the tropic belt a temperate climate. The region about Caracas in the pre-Spanish days was inhabited by Indians. Within ten or twelve leagues of this plain, it is said, were 150,000 Indians, with more than thirty *caciques*, or chiefs. These were conquered by Don Diego de Losada, and the city founded by him in 1567. Today it numbers 100,000 inhabitants, and architecturally is a beautiful city.

Its many public buildings are adorned by wonderful paintings by noted Venezuelan artists. I was guided to the places of historic interest by Señor Manuel Segundo Sanchez, a banker by

profession, but the foremost historian of Venezuela. Señor Sanchez possesses a delightful personality and a brilliant mind. He is a true lover of his native land, and was one of the representatives of his country at the presentation and unveiling of the equestrian statue of Bolivar in Central Park, New York City, in April, 1921. With him I visited the birthplace of the great Bolivar, which is being restored by the nation. Señor Tito Salas, to whom I was presented by Señor Sanchez in Bolivar's old home, is depicting on canvas the life of the great liberator and general. At the time of my visit, Salas was painting the founder of Caracas, Don Diego de Losada, in the full uniform and helmet of the *conquistador*. The artist was using the face of my distinguished friend, Señor Sanchez, as a model for this painting. In the Pantheon are the remains of Bolivar, returned to his native city from Santa Marta, Colombia, the place of his death. Over the tomb is a beautiful monument of marble, with a standing figure of Bolivar—the whole the work of the sculptor Tenerani. The Pantheon immortalizes many other patriots and statesmen and cherishes tombs or tablets to their honor.

I spent eight interesting days in Caracas, visiting its buildings, viewing its art, and in happy contact with many of its citizens, outstanding among them the members of our profession.

To Panama — Canal Zone

I left Caracas on March 17, boarding the *SS. Asian* of the Leyland Line at La Guayra that night for Colon, where I arrived on March 25. The *Asian*, in charge of her very able and friendly master, Captain Thomas, stopped at the usual way ports, affording time to visit again those interesting places, Curaçao and Cartagena.

I was delayed in the Canal Zone a full week before obtaining reservations on a steamer to Havana. I was glad of the opportunity, and spent the time with my old associates of the staff of Ancon Hospital, where I had served for three and a half years. I met Dr. Francis P. Corrigan, of Cleveland, who was just returning from a mission for the College to the republics below the equator. He was much elated over his reception by the Fellows in South America, and by their sincere interest in the American College of Surgeons.

Costa Rica — Puerto Limon

The Havana boat stopped for two days at Puerto Limon, Costa Rica, where I met Dr. Facio, Superintendent of the United Fruit Company Hospital, and his two assistants, Dr. Montealegre and Dr. Jiménez, all very able men from North American schools and hospitals.

Cuba — Havana

I arrived in Havana on the *Toloa* on April 6, and spent a week in that wonderful city. I need not describe Havana, as the port is quite familiar at least in story to nearly everyone. The harbor where our *Maine* lay buried for so many years is a very busy one, and the docks and wharves are all of modern construction. The city is a mixture of the old and the new, churches and edifices of Spanish design beside modern steel and concrete buildings. The boulevards and drives and the new residential suburb, Marianao, are beautiful. There are historical places to visit where one can speculate on the past, or there is the Casino, the race track, and the *jai alai* games where one can gamble on the future. Havana has several clubs, but the Country Club possesses the prize golf course, where royal palm trees constitute hazards, along with two brooks and a sizeable river. I thoroughly enjoyed eighteen holes on this course with Dr. Carlos E. Finlay of Havana and his brother, Mr. George Finlay, who had returned to his native heath from New York for his winter vacation. I was reluctant to leave Havana. It seemed like a wonderful playground, and North Americans have joined the Cubans in making it such. Havana is not the haven for the thirsty that many people judge it to be. There is no Volstead Law, of course, but I did not see one instance of the abuse of the use of liquor.

Homeward Bound

The *Calamares* of the Fruit Line was my homebound ship. It left Havana on the evening of April 13, and, after affording us a happy Easter aboard and a delightful voyage, landed us safely in New York on April 17.

PART II

COLOMBIA

The Welcome

I WAS welcomed at the American Legation in Bogotá by Mr. Hoffman Philip, our minister to Colombia, a very able representative of our State Department. Mr. Philip, though trained and expert in our diplomacy with the Near East, has well filled his post in Latin America, and has shown his great ability by the part he has taken in the negotiation of our treaty of friendship with Colombia. He sensed the feeling of Colombia against the United States in regard to the Panama difficulty, and has greatly aided the restoration of our former friendly and mutual relations.

Mr. Philip very graciously arranged a meeting for me with Hon. Dr. Carlos A. Urueta, the Colombian minister to Washington, who was home on a leave of absence. Dr. Urueta introduced me to Dr. Luiz Filipo Calderón, rector of the Faculty of Medicine, to whom I stated my mission. The rector, not being a surgeon, appointed Dr. José M. Montoya to call a meeting for me.

Committee on Credentials

At a meeting on February 16, Dr. Pompilio Martinez, the dean of the surgeons of Bogotá, was nominated as chairman of our credentials committee, together with the following members:

José M. Montoya, orthopedist, Bogotá, Secretary;

Rafael Ucros, gynecologist, Bogotá;

Juan B. Montoya y Flores, general surgeon, Medellin (representing Central Colombia);

Rafael Calvo, C., otologist, Cartagena (representing the Coast).

On the evening of February 19 a general meeting and dinner at the Gun Club was arranged by the committee. The rector of the Faculty presided, and, after an elaborate banquet, he gave a toast to the College for the interest shown in coming to Colombia on such a friendly mission. I responded to the profession in Colombia, and to the future of their hospitals which I judged from the signs of progress in hospital work among them. A discussion of the American College of Surgeons followed, which brought forth enthusiastic utterances as to hospital progress in case they become a part of the College.

Bogotá — Medical Center

Bogotá has always been a medical center in the New World and today contains the principal school of medicine in the country, a branch of the national university, known as the Faculty of Medicine and Natural Sciences.

The early history of the medical profession in the New World is somewhat obscure; however, some data are available in the old chronicles. The name of Garcia Fernandez is mentioned as the physician who accompanied Columbus on his first voyage to America. Many years after, in 1579, there came to Bogotá to practice medicine the Licentiate Don Alvaro de Auñón, the first *Médico Diplomado* whose name is recorded. In 1639, Dr. Diego Henriquez came from Spain with the title of *Protomédico*, whose commission was to teach medicine and grant licenses for its practice. The College of Rosario, still existent, was founded in 1640. A chair of medicine was established in this college in 1758 when, after the death of Henriquez, the Viceroy appointed Roman Gancino as *Protomédico*. This school received a royal charter in 1801, and continued to teach until the founding of the Republic, when Congress established the national university with its department of medicine. The school of medicine is well housed in new buildings, some of which are still in course of construction. Its laboratories of anatomy, pathology, bacteriology, and chemistry are up to the minute in every way, a credit to any school. It lacks a practical course in physiology and has no such laboratory. The curriculum is planned for six years, and clinical work is given in the last four years.

Hospitals

The principal hospitals of Bogotá are the San Juan de Dios, Misericordia, and Marley. The first named is the great charity hospital. It is located in the heart of the city and though it is intended for about three hundred patients, it houses twice the number. This congestion and crowding is marked to the observer. The hospital is in the charge of Sisters whose number is somewhat limited, just enough for supervision; hence the nursing system is inadequate.

The Misericordia is the children's hospital and has a capacity of one hundred and twenty beds. Its daily census runs about seventy-five. Here the proportion of Sisters to patients is higher, and more attention is given to nursing.

Marley is a private hospital, but Sisters are paid to supervise it. There are several clinics, or *casas de salud* owned by individual doctors, some in the care of Sisters, and others under women trained for the work. I visited two of

Hospital San José, Bogotá, Colombia

New Hospital Cartagena, Cartagena, Colombia

these, one under the jurisdiction of Dr. Pompilio Martinez, and the other of Dr. Manuel V. Peña. Both were adequately furnished and modern in every respect. All of the hospital operating rooms are well equipped, and aseptic technique is fully carried out. Another feature that would please our Hospital Standardization Committee is the complete hospital record system. Complete histories and progress records are kept of all patients. I watched several of the prominent surgeons operate, some difficult cases too, and all showed fine surgical skill and judgment. I attended the dedication of the new San Juan de Dios hospital in La Hortua, a suburb. It is built on the isolated pavilion plan, and will probably accommodate twelve hundred patients when completed. The buildings were originally intended for an insane asylum, but a new site was obtained in the country and the plans were changed to build them as hospital units.

The surgical society of Bogotá has been constructing a new hospital also, to be known as Hospital San José. It has been under construction for about twelve years, work being carried on as funds are available. This is a beautiful group of buildings, with large and well ventilated wards and private rooms. The operating rooms or amphitheaters are well equipped with modern apparatus, as are all the wards and departments of the institution. Nothing is wanting except a staff of doctors and nurses to step in and receive the patients.

The Nursing Problem

The nursing problem is as perplexing in Colombia as in many of the South American republics. Speaking broadly, there are no nurses, and several reasons exist for their absence. In the first place, hospitals have been charitable institutions conducted by religious orders, where the halt, the sick, and the aged have been given shelter and food and what medical care it fell within the skill of the individuals in charge to administer. No one entered save the poor. The better classes called a physician to their homes, where their friends and relatives gathered, stood watch over the sick one and cared for him. It was a work of love and not a business. Nuns gave their life to it as God's work, not as hirelings.

Another phase developed from an increase in the number of inmates in these hospitals with a corresponding decrease in the proportion of nuns to care for them. To aid them, the poor were hired to work in the wards; so nursing became menial labor. In consequence of these two conditions, nursing has not become the profession of merit and the real science as we know it in this country.

A third point held by some is a moral one. It is not considered conducive to good morals for young women to study along medical lines and then go forth to care for strangers. The young women necessary for such work, who are educated and come from good homes, are not free to enter the nursing profession. In fact women do not participate in the affairs of public life.

One of two things will be necessary to place nursing on the basis of a merited profession, and either will bring about the other as well. The people will become educated (as we say in the States) to the advantages or necessity of hospitalization of all patients, whether rich or poor, in which case the better class will demand nursing; or the public will sense its duty to the sick and develop nursing as a profession, which in turn will elevate the standard of the hospitals, and all patients will seek the protection and advantages of the hospital.

The medical profession of South America realizes the need for nurses; but it is difficult to bring about the necessary change in the mind of the public to encourage training schools.

Experimental Laboratory

Dr. Bernardo Samper and Dr. Jorge Martinez conduct a private laboratory in the city which is equipped to do all routine tests as well as produce biologic products. They manufacture vaccines, anti-diphtheritic and anti-tetanic sera, and conduct experiments in the prophylaxis of animal diseases. A North American veterinary is attached to the laboratory, and quite elaborate studies are made of anthrax, piroplasmosis, trypanosomiasis, and other stock infections.

Typhoid is endemic in Bogotá, and several years ago, at the time of my first visit, Dr. Samper and Dr. Martinez were introducing typhoid vaccination among the students, firemen, policemen, and soldiers who were stationed there. I felt that it would be a real test of the efficacy of vaccine, as no particular anti-typhoid sanitary measures were carried out. Accordingly, I was anxious to peruse the statistics of the experiment. Dr. Martinez informed me that out of ten thousand who were vaccinated, eighteen subsequently had typhoid and only one died, whereas out of ten thousand of the general population, two hundred had typhoid and twenty died. These last figures are not exact, as only records of deaths are kept, and for each twenty deaths the rate of mortality and incidence in epidemics in the United States were used, whereas the Bogotá rate is really higher. However, the comparison, such as it is, is interesting.

Medellin

Medellin is the capital of the Department of Antioquia. It is a city of 70,000, and quite progressive. A railroad connects it with the Magdalena River at Puerto Berrio. Dr. Juan B. Montoya y Flores was nominated to represent this district on the committee on credentials. Dr. Flores conducts a small private hospital called "Casa de Salud la Samaritana," and Dr. José V. Maldonado is associated with him. There is another *casa de salud* which is managed by Dr. Gil J. Gil and his associate, Dr. Alfonso Castro.

Barranquilla

Barranquilla has several small hospitals or clinics. The Clinica Moderna is operated by a group. La Casa de Salud is the private hospital of Dr. Jorge E. Calvo, and La Clinica Americana is a small hospital and clinic conducted by Dr. Willis Middleton and Dr. L. M. Drennan, two of my former associates in the Ancon Hospital.

A stock company has started construction of a modern hospital on the Prado in the residential section. It is not the intention to operate for profit, but as a philanthropic work to provide a hospital for the city, with the hope that at least the interest on the investment will be earned.

Cartagena

Cartagena is also a medical center and has a small medical school. Its equipment is rather meager and there is not ample material for clinical study in the small charity hospital. Dr. Rafael Calvo, a member of our credentials committee, is dean and professor of otology. A company headed by Dr. Calvo has opened a hospital of fifty beds, which is conducted on modern lines. Dr. Kempton Taylor is the chief surgeon, and North American nurses are in charge. The laboratory and X-ray departments have technicians from the States.

The committee on credentials in Colombia is compiling a list of its eminent surgeons, whom they will recommend for Fellowship in the College.

VENEZUELA

Arrival

On my arrival in Caracas, I visited our minister, Mr. Willis C. Cook, a very gracious and affable gentleman, who I learned had just arrived in Venezuela to take up the duties of his post. He recommended me by letter to the Minister of External Relations, Dr. Itriago Chacin, whom I visited in company with Señor Manuel Segundo Sanchez. Dr. Chacin received me warmly, and welcomed any affiliation that might be made between the surgeons of the Americas. He tendered his hearty support and offices in fostering such an affiliation.

Dr. Luiz Razetti, distinguished surgeon of Caracas, to whom I presented the letter of greeting from the Director-General of the American College of Surgeons to the surgeons of Venezuela, called a meeting of the surgeons on March 16 in the Assembly Hall of the Academy of Medicine. Twenty-four surgeons were present at this meeting and a committee of five was nominated to wait upon me. This committee met with me in my hotel on March 17 to discuss the American College of Surgeons and the purpose of my visit. All were strongly in favor of the College, its aim and its work, and gladly subscribed themselves as a committee on credentials to further the admission and affiliation of Venezuelan surgeons.

Committee on Credentials

The committee is quite representative of the surgical specialties, and all are men of high professional attainments. They are:

Luiz Razetti, general surgeon and orthopedist, chairman;
Salvador Cordoba, urologist, secretary;
David Lobo, gynecologist and obstetrician;
J. M. Espino, ophthalmologist;
E. Conde Flores, oto-rhino-laryngologist.

These gentlemen will recommend for Fellowship a selected group of the prominent and qualified surgeons of Venezuela. A partial list of these includes:

Miguel R. Ruiz, Caracas;
Adolfo Bueno, Caracas;
Martin Herrera, Caracas;
P. D. Rodriguez Rivero, Puerto Cabello.

Hospitals of Caracas

The principal hospital of Caracas is Hospital Vargas. It received its name from one of the republic's early physicians and statesmen. Besides many monuments throughout the republic and having this great hospital named for him, this Doctor of Medicine has been honored with a resting place in the National Pantheon. Hospital Vargas is conducted by Sisters, and contains about six hundred beds placed in wards that are grouped on the sides of a great open court and connected by open passageways. The space between the ward buildings is beautifully decorated with flower beds and arbors, making delightful spots that the convalescent can always enjoy.

The operating rooms and laboratories are entirely modern in every way, and in them I saw a high class of work being done, the surgeons using the French technique.

Medical School, Caracas

The medical school is not functioning at present, and medical education is carried on by the old system of tutors and preceptors. The young aspirant, after having served his time under his several preceptors, is examined and asked to present his thesis. If all is satisfactory, he is granted his license to practice medicine. The profession entertains the hope of soon re-establishing the school, and the faculty is nominally existent and ready for work.

Caracas

Caracas, from a sanitary standpoint, is very clean. Venezuela in the past few years has built up a most efficient sanitary department through the untiring efforts of the Director of National Sanitation, Dr. L. G. Chacin Itriago. Dr. Itriago is a relative of the Minister of External Relations, Dr. Itriago Chacin. To distinguish them in official circles they are called respectively Dr. Chacin *adelante* and *detrás*, meaning Doctor Chacin (before) and Doctor Chacin (after). The laboratory of the sanitary department is a great institution of research and investigation. Experts conduct the several departments of chemistry, analysis, bacteriology, epidemiology, and pathology. The director is a man of winning personality, a fine executive, and withal a man of science. I was his guest at a dinner in one of the clubs, and several times during my stay enjoyed his company and informal discussions of his work.

The early arrival of my boat in port prevented me from remaining for a dinner which was to have been given to me as a representative of the College by the surgeons of Caracas. I regret that I was unable to meet once more such a fine body of men.

Venezuela has several cities of importance, all of which have hospitals: Valencia, with a population of 70,000; Maracaibo, 50,000; Barquisimeto, 35,000; and Ciudad Bolivar, 20,000.

Cuba

Surgeons of Havana — Committee on Credentials

After paying my respects to Mr. Philander L. Cable, Chargé d'Affaires of the American Legation in Havana, I met, through an appointment made by Mr. Cable, the Secretary of Sanitation and Public Charities, Dr. Juan Guiteras.

Dr. Guiteras called a meeting of the surgeons for the next afternoon at which I explained my visit as a representative of the American College of Surgeons, and discussed with them the object and aims of the College. All favored the plan of making the College Pan-American in its scope and readily nominated a committee of three to act for Cuba. Those nominated were:

José A. Presno, general surgeon, chairman;
Rafael Menocal, general surgeon, secretary;
Carlos E. Finlay, ophthalmologist.

Recommendations for Fellowship

I met with these gentlemen at a later date at the home of Dr. Presno to inform them more fully of the work engaged in by the American College of Surgeons and the privileges of Fellowship.

I found in Cuba a greater number of specialists than in the other countries. Havana, of course, is a larger city, and the men can more easily limit themselves to their particular branch of work.

The committee recommended for Fellowship a group of qualified surgeons. This list, though not complete, includes:

Havana
- Ernesto de Aragon
- Julio Arteaga
- Gonzalo Arostegui
- Claudio Basterrechea
- Julio Ortiz Cano
- Arturo G. Casariego
- Gabriel Casuso, Jr.
- José E. Casuso
- Manuel Costales
- José de Cubas
- Jorge Dehogues
- Gustavo Duplessis
- Francisco M. Fernandez
- Santos Fernandez
- Enrique Fortun
- Nicolás Gomez de Rosas
- Rodolfo Guiral
- Eusebio Hernandez
- Alberto Inclan
- Pedro Lamothe
- Francisco Leza
- Anton Lutz
- Sergio Garcia Marruz
- Emilio Martinez
- Rafael Nogueira
- Ricardo Nuñez
- Felix Pagés
- Ignacio B. Plasencia
- Luis F. Rodriguez Molina
- Emilio Romero
- Alberto Sanchez de Bustamante
- Enrique Fernandez Soto
- Benigno Souza
- Elpidio Stincer
- Agustin de Varona

Camagüey
- La Herran
- Justo Lamar

Cardenas
- Luis Ros

Cienfuegos
- Alfredo Mendez

Manzanillo
- Ciro Leon

Matanzas
- Julio Ortiz Coffigny

Pinar del Rio
- Leon Cuervo

Sagua la Grande
- Enrique Yaniz

Santa Clara
- Olivio Lubian

Santiago de Cuba
- Antonio Guernica
- Donato G. Marmol
- José A. Ortiz

Hospitals

Hospital conditions are much better in Havana than in many countries, the total number of hospital beds being about six thousand. There are five training schools for nurses in Cuba, two being in Havana and one each in Santiago, Camagüey, and Matanzas. The largest city hospital is the Calixto Garcia of about nine hundred beds. It has recently been given to the University of Havana Medical School as a teaching hospital. The total cost of its eighteen buildings when finished will be about $700,000.00. Up to date $400,000.00 has been spent in the construction of ten buildings and their equipment.

The Mercedes Hospital of twelve pavilions, with three hundred beds, has a training school of twenty-five pupil nurses, and employs twenty-eight graduates. The Maternity Hospital is conducted by the Health Department, and it too has a training school. There are six graduate nurses and eight pupils. Eight fourth-year medical students act as internes and assist in over three hundred labors per year. This institution comprises a day nursery, and instructions are given to mothers on infant feeding and care.

The Emergency Hospital has one hundred beds; the Asylum for the Insane, two thousand beds; and the Leprosarium, one hundred beds.

There are eight hospitals in Havana belonging to Spanish Associations. One of these Associations has 70,000 members, each of whom pays Two Dollars a month and receives free medical and surgical treatment as well as hospitalization. Membership also includes club privileges, and the advantage of courses in bookkeeping, typewriting, languages, mathematics, etc. Many of the Associations have outside enterprises, such as theaters, whose earnings are turned into the general fund.

These Associations were formed when Cuba was a Spanish colony. The Spanish emigrant coming to Cuba was always sure to have his attack of yellow fever, and the men of his native province in Spain banded together to give him medical care until he acquired his immunity, or to give him a respectable burial in the event of his death. The Associations are usually named after the provinces of Spain, and their hospitals are models of completeness. I visited Covadonga, the Asturian Association hospital, where Dr. Presno is chief surgeon and where I saw him very skillfully do a nephrotomy for calculus. This hospital has beautiful grounds and airy pavilions that accommodate about eight hundred patients. These hospitals are for male patients only, and the nursing is done by men who are trained for the work.

Medical School

The medical school is a part of the University of Havana. I met the distinguished rector of the University, Dr. Carlos La Torre (D.Sc., Harvard, Hon.) and also the Dean of the Medical School, Dr. Diego Tamayo. Dr. Tamayo has established a dispensary in Havana and in connection with it conducts a post-graduate school in the specialties. The clinic treats about fifteen thousand patients per year, and fills a long-felt need for the poor of the city.

The medical school is poorly housed at present and has only a lecture hall, an anatomy building, and the General Wood Laboratory. The faculty hope to be able to sell the old grounds and building and place the school within the grounds of the new University Hospital, recently acquired from the Government.

Department of Health and Charities

The Department of Health and Charities has reached a high point of perfection under the administration of Dr. Juan Guiteras, the Secretary. Dr. Guiteras is known to us through his work in yellow fever with the Reed-Carrol Commission, and in recent years with the late General Gorgas and Dr. Henry Carter. The theory of the mosquito transmission of yellow fever was a Cuban product, and was evolved in the mind of Dr. Carlos Finlay, the father of Dr. Carlos E. Finlay.

Curaçao

While in Curaçao I visited St. Elizabeth's Hospital, which is conducted by Sisters of the order of St. Francis from Holland. There are forty-three Sisters, six of whom are trained nurses. The hospital contains two hundred beds and resembles in administration the hospitals of the States.

The Green Cross Sanitarium of fifty-bed capacity is also well conducted.

Dr. H. Boogart practices general surgery, Dr. M. Goodhart does ear, nose, and throat work, and Dr. H. Ferguson is an ophthalmologist of great prominence in the countries near by. He is quite expert in cataract extraction and enjoys an enviable reputation for such.

In Conclusion

Everywhere on my trip the extension of the American College of Surgeons was enthusiastically received, and a desire to co-operate in the uniting of American surgeons was manifested. It has often been said that an anti North American feeling exists in Latin America, and many regrettable incidents have occurred that would foster such a feeling, if it existed. In racial tendencies, South America has always had a pro-European feeling, that is a sympathetic feeling for the South European countries, France, Spain and Italy, which is quite natural. This should not be interpreted as anti North American. For years men of science from these countries have studied in Europe and have acquired a natural sentiment toward things European, and a bond of friendship exists with its people. It comes partly from the interchange and partly from a love for the motherland. Had we the same understanding of the South American, our association and friendly relations would increase from our propinquity.

If there is one virtue that the North American acquires when he meets and learns to know his South American colleague, it is humility. Rubbing elbows with the men of science of the southland, men who are cultured and refined, who find time for the arts, are linguists and travelers, who in their profession are serious and progressive and after all still have time for play, makes us feel our littleness, our limitations. Whatever it may be, we certainly have missed a lot of the good things of life through the improper proportioning of our study hours. We usually think of the Latin-American as a person of impulse. To jump at conclusions is left for northern blood. The Latin reaches his decisions by deliberation and analysis. His wit is as keen and his humor as deep as the Gael, but his impulsiveness is his passion and is revealed only in love and war. To know the South American is to appreciate a warm friend and to love him.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

TWELFTH ANNUAL SESSION, BOSTON, OCTOBER 23–27, 1922

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PLANS FOR THE CLINICAL CONGRESS IN BOSTON

IN the following pages will be found a preliminary program for the evening meetings of the Boston session as arranged by the Executive Committee of the Clinical Congress.

The Congress formally opens on Monday evening with the presidential meeting in Symphony Hall. On this occasion the distinguished foreign guests will be presented, and the President-Elect, Dr. Harvey Cushing, will deliver his inaugural address. Professor Raffaele Bastianelli of Rome, Italy, will present the John B. Murphy Oration in Surgery, taking for his subject "Surgery of the Joints."

Interesting programs have been prepared for the sessions on Tuesday and Thursday evenings in Jordan Hall, at which papers will be read and discussed by eminent surgeons especially selected as qualified to discuss the subjects under consideration.

On Wednesday evening the Fellows and their ladies will be guests of the Boston Surgical Society at a special meeting in Jordan Hall, the occasion being the presentation of the Henry Jacob Bigelow medal to Dr. William Williams Keen of Philadelphia.

At the tenth convocation of the American College of Surgeons to be held on Friday evening in Symphony Hall, fellowship in the College will be conferred upon a group of American and Canadian surgeons, and honorary fellowships upon a number of distinguished foreign guests. Professor Raffaele Bastianelli will deliver the fellowship address.

The following distinguished Latin-American surgeons are expected to attend the Clinical Congress: Dr. José E. Casuso, Dr. José A. Presno, and Dr. Rafael Menocal of Havana, Cuba; Dr. Gabriel M. Malda and Dr. Ulises Valdes of Mexico; Dr. José Arce of Buenos Aires, Argentina; Dr. Claudio J. Sanjines of La Paz, Bolivia; Dr. Olympio da Fonseca of Rio de Janeiro, Brazil; Dr. Gregorio Amunategui and Dr. Lucas Sierra of Santiago, Chile; Surgeon-General Alberto Adriasola and Dr. Guillermo E. Muennich of Valparaiso, Chile; Dr. Pompilio Martinez of Bogotá, Colombia; Dr. Francisco Graña of Lima, Peru; Dr. Enrique Pouey of Montevideo, Uruguay; and Dr. Louis Razetti of Caracas, Venezuela.

THE CLINICAL PROGRAM

The plans for the Boston meeting will in a general way conform to those of previous sessions of the Congress. Clinical demonstrations at the hospitals and medical schools will fill the morning and afternoon hours of each of the four days of the Congress, Tuesday to Friday inclusive. The Committee on Arrangements is de-

veloping a program of clinics and demonstrations that will completely represent the clinical activities of that great medical center. All departments of surgery will be represented in this clinical program, including gynecology, obstetrics, orthopedics, urology, surgery of the eye, ear, nose, throat, and mouth, experimental surgery, surgical pathology, roentgenology, etc.

The institutions which will co-operate in providing the clinical program are as follows:

Harvard Medical School
Boston University Medical School
Tufts College Medical School
Beth Israel Hospital
Evangeline Booth Hospital
Boston City Hospital
Boston Dispensary
Boston Lying-In Hospital
Peter Bent Brigham Hospital
Cambridge Hospital
Carney Hospital
Children's Hospital
Forsythe Dental Infirmary
Free Hospital for Women
Huntington Memorial Hospital
Long Island Hospital
Massachusetts Charitable Eye and Ear Infirmary
Massachusetts General Hospital
Massachusetts Homeopathic Hospital
New England Deaconess Hospital
New England Hospital for Women and Children
St. Elizabeth's Hospital
U. S. Naval Hospital
Vincent Hospital

HOSPITAL CONFERENCE

The first day of the Boston session, Monday, October 23, will be devoted to a hospital conference. The large attendance, interesting papers, and enlightening discussions at the Philadelphia meeting last year insured a permanent place for a hospital conference at each succeeding Congress. At this conference representative surgeons, hospital superintendents, and hospital trustees will present addresses, to be followed by a general discussion open to all. It is expected that this meeting will present a digest of past performances and current opinions relative to hospital service. Any topic of interest may be presented in the general discussion. A complete program for the conference will be mailed previous to the meeting to all interested in hospital problems.

The following is a partial list of speakers who have been invited to participate in the morning session: Dr. Franklin H. Martin, Dr. Newton E. Davis, Dr. George W. Swift, Mr. John G. Bowman, Dr. Delmar A. Craig, Rev. Charles B. Moulinier, S. J., Dr. E. A. Codman, Mr. Robert E. Jolly, Dr. A. R. Warner, Dr. Frederic A. Washburn, and Dr. M. T. MacEachern.

In the afternoon Dr. M. T. MacEachern will conduct a round table discussion at which the vital hospital problems will be summarized by staff members, superintendents, and members of boards of trustees.

HEADQUARTERS

General headquarters for the Congress will be at the Copley Plaza Hotel, which is centrally located in the Back Bay district. The large ballroom of the hotel, foyers adjacent thereto with other large rooms on the main floor, have been reserved for the use of the Congress, affording ample space for registration and ticket bureaus, bulletin rooms, etc.

Headquarters will be open for registration at 12 M. Monday, October 23. The clinical program for Tuesday will be bulletined during the afternoon, and tickets for Tuesday's clinics will be issued as visiting surgeons register.

REDUCED RAILWAY FARES

The railways of the United States and Canada with but few exceptions have authorized the sale of round-trip tickets to Boston on account of the Clinical Congress at one and one-half the ordinary one-way fare, provided that the journey be made by the same route both going to and returning from Boston. Round-trip tickets will be sold to members only upon presentation of identification certificates issued from the office of the Director-General. Such identification certificates will be issued to all who register in advance, one certificate being sufficient for the individual surgeon and dependent members of his family. Under this arrangement round-trip tickets will be sold from October 19 to 25 in the central and eastern states, and eastern Canada, with a final return limit of November 2.

LIMITED ATTENDANCE—ADVANCE REGISTRATION

Because of the popularity of these annual clinical meetings it has been found necessary in recent years to adopt the plan of limiting attendance to a number that can be comfortably accommodated. The limit of attendance is based upon the result of a survey of the amphitheaters, lecture rooms, and laboratories of the several hospitals and medical schools as to their capacity for accommodating visitors. This plan requires registration in advance on the part of all who expect to attend, and when the limit of attendance has been reached through such advance registration at the office of the College, no further applications will be accepted. This plan insures accommodations at the clinics for all who register

in advance, and the necessity for adopting such a plan will be apparent to all. Already there has been a very large advance registration, and it is probable that the limit of attendance will be reached some weeks in advance of the meeting.

HOTEL ACCOMMODATIONS

The Committee on Arrangements has appointed a Committee on Hotels, with Dr. Stephen Rushmore as Chairman, to aid Fellows in securing hotel accommodations during the Boston meeting. Boston has ample hotel facilities, many first-class hotels being located within walking distance of headquarters. Fellows are requested to make their applications for accommodations direct to the hotels named in the list recommended by the Committee as printed below. If difficulty is experienced in securing satisfactory accommodations the matter should be taken up with Dr. Rushmore, 520 Commonwealth Avenue, Boston.

CLINIC TICKETS

Attendance at all clinics and demonstrations is controlled by means of special clinic tickets. This has proven an efficient means of providing for the distribution of the visiting surgeons among the several clinics, and insures against overcrowding. The number of tickets issued for any clinic is limited to the capacity of the room in which that clinic is to be given. Tickets are issued at headquarters each morning at 8 o'clock.

Each afternoon during the session, a complete program of the following day's clinics will be posted on bulletin boards at headquarters. After the program has been so posted, reservations for tickets for the next day's clinics may be filed, the clinic tickets to be issued the following morning at 8 o'clock. A printed program will be issued each morning which will contain the complete clinical program for the day, with announcements of evening sessions and other information.

REGISTRATION FEE

Plans for the Congress provide that no financial burden may be imposed upon the members of the profession in the city entertaining the Congress. Hence a registration fee of $5.00 is required of each surgeon attending the annual clinical meeting, such fees providing the funds from which to meet the expenses of conducting the meeting. To each surgeon on registering in advance is issued a formal receipt for the registration fee, which receipt is to be exchanged for a general admission card upon his registration at headquarters in Boston. This card, which is non-transferable, must be presented to secure special clinic tickets and for admission to the evening meetings.

BOSTON HOTELS WITH RATES

	Single Room		Double Room	
	With Bath	Without	With Bath	Without
Adams House, 553 Washington St			6.00– 7.00	3.50–4.50
American House, 56 Hanover St			6.00	4.00
Arlington, 18 Chandler St	2.50–3.00		4.00– 5.00	
Avery, 24 Avery St			6.00	
Bellevue, 21 Beacon St			8.00–10.00	4.00–6.00
Brewster, 19 Boylston St	3.00–4.00	2.50–3.00	5.00– 7.00	
Brunswick, Boylston and Clarendon	4.00	3.00	6.00– 7.00	5.00
Buckminster, 641 Beacon St	3.00	2.50	6.00	5.00
Commonwealth, Bowdoin St			5.00	
Copley Plaza, Copley Square	6.00		11.00	
Copley Square, 49 Huntington Ave	4.00		6.00	
Essex, 693 Atlantic Ave	5.00	3.00–3.50	7.00– 8.00	
Fritz-Carleton, 1138 Boylston St		3.00	8.00–10.00	4.50
Garrison Hall, 8 Garrison St	3.00		5.00	
Langham, 1699 Washington St	3.00	2.00	4.00	3.00
Lenox, Exeter and Boylston	5.00	3.50	8.00	5.00
Parker House, School and Tremont	5.50–7.00	4.00–4.50	5.50– 7.00	5.00
Plaza, 419 Columbus Ave			5.00	3.00
Priscilla (women only), 307 Huntington Ave	3.00		4.50– 6.00	
Puritan, 390 Commonwealth Ave	5.00	2.50	6.00	
Putnam, 284 Huntington Ave		2.00–3.00		3.00–4.00
Quincy, 47 Brattle St	3.50	2.00–2.50	6.00– 7.00	3.50–4.00
Ranelegh, 11 Mountfort St			5.00	
Somerset, Commonwealth and Charlesgate			10.00	5.00
Stewart Club (women only), 102 Fenway		3.50		6.00
United States, 90 Beach St		2.50		4.00
Vendome (American plan), Commonwealth and Dartmouth	8.00		14.00–16.00	
Victoria, 271 Dartmouth St	4.00	3.00	6.00	5.00
Westminster, Copley Square	4.00	2.50	7.00	3.50
Young's, Court and City Hall			7.00– 8.00	4.50–5.00

PROGRAM FOR EVENING MEETINGS

Presidential Meeting, Monday, October 23—Symphony Hall, 8 P.M.

Address of Welcome: LINCOLN DAVIS, M.D., Boston, Chairman of Committee on Arrangements.

Address of the retiring president: JOHN B. DEAVER, M.D., Philadelphia.

Introduction of foreign guests: RAFFAELE BASTIANELLI, M.D., F.R.C.S. (Hon.), Rome; FRANCIS SEYMOUR KIDD, M.Ch., F.R.C.S., London; ANDREW FULLERTON, C.B., C.M.G., Belfast; EINAR KEY, M.D., Stockholm.

Inaugural Address: HARVEY CUSHING, M.D., Boston.

The Doctor John B. Murphy Oration in Surgery—"Surgery of the Joints": RAFFAELE BASTIANELLI, M.D., F.R.C.S. (Hon.), Rome.

Tuesday, October 24—Jordan Hall, 8 P.M.

EINAR KEY, M.D., Stockholm: Treatment by Embolectomy of Circulatory Disturbances in the Extremities Due to Emboli.

SYMPOSIUM: Genito-Urinary Surgery.

HUGH H. YOUNG, M.D., Baltimore: Prostatectomy—Preparatory, Operative, and Post-Operative Methods.

FRANCIS SEYMOUR KIDD, M.Ch., F.R.C.S., London: Simple Mesodermal Tumors of the Urinary Bladder; with the Report of a Case Treated by Operation.

ANDREW FULLERTON, C.B., C.M.G., Belfast: A Note on Unilateral Diuresis.

J. BENTLEY SQUIER, M.D., New York: The Surgery of Vesical Neoplasms.

Discussion: WILLIAM C. QUINBY, M.D., Boston; ALEXANDER RANDALL, M.D., Philadelphia; JOHN T. GERAGHTY, M.D., Baltimore; JOHN H. CUNNINGHAM, M.D., Boston.

Wednesday, October 25—Jordan Hall, 8:30 P.M.

SPECIAL MEETING OF THE BOSTON SURGICAL SOCIETY

Introductory Remarks: ROBERT W. LOVETT, M.D., Boston, President.

Presentation of Henry J. Bigelow Medal to WILLIAM WILLIAMS KEEN, M.D., Philadelphia.

"Sixty Years Ago—1862 to 1922": WILLIAM WILLIAMS KEEN, M.D., Philadelphia.

Thursday, October 26—Jordan Hall, 8 P.M.

SYMPOSIUM: Carcinoma of the Jaws, Tongue, and Cheeks and Lips.

GEORGE W. CRILE, M.D., Cleveland: General Principles Involved in Operations; Summary of Results Obtained in the Crile Clinic, with Special Reference to Treatment of Carcinoma of the Jaws.

EDWARD S. JUDD, M.D., Rochester, Minn.: Summary of Results Obtained in the Mayo Clinic, with Special Reference to Treatment of Cancer of the Tongue.

GEORGE E. BREWER, M.D., New York: Summary of Results Obtained in the Presbyterian, Memorial, and Roosevelt Hospitals of New York, with Special Reference to Treatment of Cancer of the Cheeks and Lips.

Discussion: ROBERT B. GREENOUGH, M.D., Boston; ALBERT J. OCHSNER, M.D., Chicago; VILRAY P. BLAIR, M.D., St. Louis; JOSEPH C. BLOODGOOD, M.D., Baltimore; DOUGLAS A. QUICK, M.D., New York; GEORGE P. MULLER, M.D., Philadelphia; H. R. GAYLORD, M.D., Buffalo; ALEXANDER E. GARROW, M.D., Montreal; CHANNING C. SIMMONS, M.D., Boston.

Friday, October 27—Symphony Hall, 8 P.M.

CONVOCATION OF THE AMERICAN COLLEGE OF SURGEONS

Invocation: Reverend Doctor ALEXANDER MANN, Boston.

Conferring of Honorary Fellowships.

Presentation of Candidates for Fellowship.

Presidential Address: HARVEY CUSHING, M.D., Boston.

Fellowship Address: RAFFAELE BASTIANELLI, M.D., F.R.C.S. (Hon.), Rome.